March, 1948

EDISON ELECTRIC INSTITUTE BULLETIN

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PUBLISHED MONTHLY BY EDISON ELECTRIC INSTITUTE

ELECTRICAL RESEARCH STATISTICS
THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

December, 1946-1947

SOURCE AND DISPOSAL OF ENERGY - MONTH OF DECEMBER

	1947	1946	%
GENERATION* (Net)			
By Fuel Burning Plants	17,099,214,000	14,269,151,000	+19.8
By Water Power Plants	6,412,699,000	6,577,688,000	- 2.5
TOTAL GENERATION	23,511,913,000	20,846,839,000	+12.8
Add -- Net Imports Over International Boundaries	79,985,000	106,851,000	-25.1
Less--Company Use	139,927,000	142,428,000	- 1.8
Less--Energy Used by Producer	530,288,000	394,964,000	
NET ENERGY FOR DISTRIBUTION	22,921,683,000	20,416,298,000	+12.3
Losses and Unaccounted for	3,304,642,000	2,966,018,000	+11.4
SALES TO ULTIMATE CUSTOMERS	19,617,041,000	17,450,280,000	+12.4

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS - As of December 31st			
Residential or Domestic	31,621,959	29,769,107	+ 6.2
Rural (Distinct Rural Rates)	1,522,136	1,381.291	+10.2
Commercial or Industrial			
Small Light & Power	4,960,895	4,692,850)	+ 5.8
Large Light & Power	191,363	174,662)	
Other Customers	135,597	122,381	+10.8
TOTAL ULTIMATE CUSTOMERS	38,431,950	36,140,291	+ 6.3
KILOWATTHOUR SALES - During Month of December			
Residential or Domestic	4,329,401,000	3,739,312,000	+15.8
Rural (Distinct Rural Rates)	379,101,000	302,259,000	+25.4
Commercial or Industrial			
Small Light & Power	3,490,011,000	3,017,837,000	+15.6
Large Light & Power	9,934,205,000	8,831,874,000	+12.5
Street and Highway Lighting	250,818,000	236,296,000	+ 6.1
Other Public Authorities	529,745,000	600,162,000	-11.7
Railways and Railroads			
Street & Interurban Railways	408,593,000	428,318,000	- 4.6
Electrified Steam Railroads	239,364,000	238,882,000	+ 0.2
Interdepartmental	55,803,000	55,340,000	+ 0.8
TOTAL TO ULTIMATE CUSTOMERS	19,617,041,000	17,450,280,000	+12.4
REVENUES FROM ULTIMATE CUSTOMERS	$ 351,460,200	$ 311,020,400	+13.0

RESIDENTIAL OR DOMESTIC SERVICE

Average Customer Data - for 12 months ended December 31st			
Kilowatthours per Customer	1,438	1,329	+ 8.2
Average Annual Bill	$44.43	$42.79	+ 3.8
Revenue per Kilowatthour	3.09¢	3.22¢	- 4.0

(*) By courtesy of the Federal Power Commission

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume 16 MARCH, 1948 No. 3

The 16th Convention of the Institute

Emphasis to be Placed on Financial Aspects of Expansion Program

THE PROGRAM for the 16th Annual E.E.I. Convention, to be held at Atlantic City, N. J., June 1-3, reveals a proper emphasis on the most prominent of all the tasks that now confront the industry—the successful completion of the largest expansion project that any American business has ever dared to conceive and move to execute—a program of planned growth so vast that Charles E. Oakes, E.E.I. President, has called it the "greatest challenge ever faced by any industry."

Convention Program Highlights

Leading utility executives, representatives of financial institutions and economists will appear before convention delegates to describe the varied aspects of this tremendous expansion of power stations and transmission-distribution facilities, and to analyze the vast financing measures that are involved. Electric utility management executives, engineering and accounting personnel, and new business men, in fact, everyone concerned with the production and sale of electric energy, will find this a rare opportunity to learn how the effects of this epic growth will be felt in their own daily work; to gain a clear understanding of the many ramifications of the industry's expansion plan, plus invaluable advice and information that will be helpful for many months to come.

The Convention Program Committee, headed by Chairman Walter H. Sammis, President of the Ohio Edison Company, has placed quality above quantity in choosing speakers for the program. A total of fifteen talks are scheduled, to include six industry spokesmen and nine prominent speakers from business and professional fields outside the electrical industry.

The compact program will begin with an afternoon session on Tuesday, June 1st, and will continue with all-day sessions on Wednesday and Thursday, June 2nd and 3rd. Tuesday morning, June 1st, will be devoted to three open meetings sponsored by the Accounting, Engineering and Commercial Divisions of E.E.I., at which the plans of these sections for the coming year will be presented. These meetings will be of genuine interest to convention delegates, and all are cordially invited to attend as many as time will allow.

WALTER H. SAMMIS
Chairman, Program Committee

The Expansion Program

Heading the group of speakers who will deal with the plans for the industry's growth over the next few years will be Charles E. Oakes, President of the Institute, and President of the Pennsylvania Power & Light Company. In his address, which will follow the welcome to Atlantic City by Mayor Altman, Mr. Oakes will review the most important events that have occurred within the industry during the past year, and will report upon the success to date of the industry's moves to expand its capacity.

The Hon. H. Lester Hooker, Commissioner, Virginia State Corporation Commission, will follow Mr. Oakes with a discussion of "The Importance of Keeping the Power Industry Financially Sound." Judge Hooker will outline many of the reasons why the industry and regulatory authorities should cooperate in determining sound methods by which the vast capital required for expansion can best be obtained.

Financial Aspects

Two talks on the industry's growth plans are scheduled for the second general session on Wednesday morning. Alan H. Temple, Vice-President of the National City Bank of New York, will compare electric utility earnings with those of other major industries in the phases of the business cycle, as considered from the viewpoints of long-range growth, fluctuation of operating revenues and net income, and other factors pertinent to the rating of utility securities for investment.

Edward Hopkinson, Jr., Partner in Drexel and Company, Philadelphia, Pa., and past president of the Investment Bankers Association of America, will draw upon his many years of experience in the investment banking field in his analysis of the change from a seller's to a purchaser's market in securities. His advice on the styling of new security issues to best take advantage of the present changing conditions should be most helpful to utility executives.

On Wednesday afternoon, Dr. Lionel D. Edie, consulting economist and President of Lionel D. Edie and Company, New York, will discuss the overall demand for electricity, as influenced by industrial production levels and income payments,

CONVENTION TIME TABLE

All of the business sessions of the Sixteenth Annual Convention of the Edison Electric Institute will be held at the Atlantic City Convention Hall; committee meetings and social functions at the Hotel Traymore, with the exception of the luncheons for the Ladies. The Convention time table follows:

Monday, May 31st

11:00 a m	Registration opens in main lobby of Hotel Traymore and will continue until 5 p m

Tuesday, June 1st

8:30 a m	Registration opens in main lobby of Hotel Traymore
10:00 a m	Accounting Division General Committee, Stratosphere Room, 8th Floor, Hotel Traymore
10:00 a m	Commercial Division General Committee, Rose Room, Mezzanine, Hotel Traymore
10:00 a m	Engineering Division General Committee, Belvedere Room, 11th Floor, Hotel Traymore
12:30 p m	Registration opens in the main lobby of the Atlantic City Convention Hall
2:00 p m	First General Session, Ballroom, Atlantic City Convention Hall
5:00 to 7:00 p m	Cocktail party, American Room, Hotel Traymore General Electric Company, Host

Wednesday, June 2nd

9:00 a m	Registration opens in main lobby, Atlantic City Convention Hall
10:00 a m	Second General Session, Ballroom, Atlantic City Convention Hall
12:30 p m	Board of Directors' luncheon-meeting, Hotel Traymore
2:00 p m	Third General Session, Ballroom, Atlantic City Convention Hall
5:00 to 7:00 p m	Cocktail party, American Room, Hotel Traymore Westinghouse Electric Corporation, Host

Thursday, June 3rd

9:00 a m	Registration opens in main lobby, Atlantic City Convention Hall
10:00 a m	Fourth General Session, Ballroom, Atlantic City Convention Hall
12:00 noon	Ladies' luncheon: Special buses will leave Hotel Traymore for the Brighton Nurseries (the famous $1,000,000 Orchid Farm) and then proceed to the Seaview Country Club, Absecon, N. J., Nash-Kelvinator, Host
2:00 p m	Fifth General Session, Ballroom, Atlantic City Convention Hall
7:00 p m	Informal Buffet, entertainment and dancing

ADMITTANCE TO ALL BUSINESS SESSIONS AND SOCIAL FUNCTIONS WILL BE BY CONVENTION BADGE ONLY

and will analyze the problem of raising new capital. He will also describe the impact of these factors upon utility rate structures.

The depressing effect of present federal tax laws on the ability of business enterprises to raise new capital will be the subject of a talk by Lee P. Stack, Vice-President of the John Hancock Mutual Life Insurance Company, Boston, Mass. Mr. Stack will also discuss what can be done to lessen such obstacles to healthy expansion.

George E. Whitwell, Vice-President of the Philadelphia Electric Company, speaking at the concluding general session on Thursday afternoon, will tell us how selective selling now can bring maximum benefits in the future to the industry and its security-holders. Mr. Whitwell will also take a realistic look at today's electric utility selling activities, and sales organizations.

"Sound Rate Design in Tomorrow's Economy" will be discussed by E. N. Strait, Chairman of the E.E.I. Rate Service Committee, and Manager, Rate and Research Division, Pioneering Service and Engineering Company, Chicago. Mr. Strait will present a practical analysis of rate construction best designed for present and future conditions, with a view of assuring adequate returns to the investor and fair charges to the customer.

Thus a total of eight out of the fifteen speakers will devote their platform time to the expansion program and its meaning for our industry. The information that such speakers will impart will help utility executives to see the picture of their companies' growth plans against the broad background of the industry itself, and should be of immeasurable aid in planning individual company expansion for the most benefit to customers, security holders and the company itself.

Other Important Topics Scheduled

The expansion program is of course but one of a number of problems that crowd for a place on executive agendas. Many other matters are of absorbing interest to the industry at this time, and the most vital have been given a due share of prominence on the convention program.

On Tuesday afternoon, Chester H. Lang, Vice-President and General Manager of the Apparatus Division, General Electric Company, will describe the matchless record set for us by the pioneers and master-builders of our industry—a tradition that should make the obstacles still in our path easier to surmount.

Cyrus S. Ching, Director, Federal Mediation and Conciliation Service, Washington, D. C., and a nationally known authority on labor relations, will discuss on Wednesday morning the role of government in labor relations. Mr. Ching plans to emphasize the responsibility of those engaged in collective bargaining to the nation as a whole, as well as to the employers and employees represented.

"Thirty Thousand Hours a Minute" is the intriguing title of an address by Gwilym A. Price, President of the Westinghouse Electric Corporation, which will be heard on Wednesday afternoon. Mr. Price will discuss present and future trends in industry, with emphasis on those of interest and potential benefit to electric companies.

The Thursday morning session will be-

(*Continued on page* 88)

Hotel Reservations

Atlantic City hotels are expected to be crowded by Decoration Day week-enders, Saturday through Monday, May 29 to 31. Those planning to attend the Convention who also desire to spend the Decoration Day holiday in Atlantic City, should place hotel reservations at the earliest possible time.

In connection with hotel reservations please note that *important business sessions will be held on both morning and afternoon of June 3 the last day of the Convention and a special entertainment feature will be presented on the evening of the same day.*

Hotel reservation blanks may be obtained from the Secretary, Edison Electric Institute, 420 Lexington Avenue, New York 17, N. Y.

FIRST GENERAL SESSION
Tuesday, June 1—2 P. M.

The Electric Industry in 1948—The President's Address

CHARLES E. OAKES

President, Edison Electric Institute

The President's address promises a pertinent pointing up of the progress of our industry during the critical year of 1947 and the problems ahead in the greatest expansion period in our industry's history.

The Importance of Keeping the Power Industry Financially Sound

HON. H. LESTER HOOKER

Commissioner, Virginia State Corporation Commission, Richmond, Virginia

The interests of both the investor and the rate payer are vitally affected by the maintenance of the financial soundness of the power industry. The industry and the regulatory authorities should cooperate in the determination of sound methods for obtaining the vast amount of capital required for expansion.

Stone Walls to Surmount

CHESTER H. LANG

Vice-President and General Manager of Sales, Apparatus Department, General Electric Company

To the pioneers of the electrical industry, stone walls in the way of progress were objects to be surmounted, outflanked or demolished. Have we got what it takes to continue in the tradition of the master-builders of the industry?

SECOND GENERAL SESSION
Wednesday, June 2—10 A. M.

The Role of Government in Labor Relations

CYRUS S. CHING

Director, Federal Mediation and Conciliation Service, Washington, D. C.

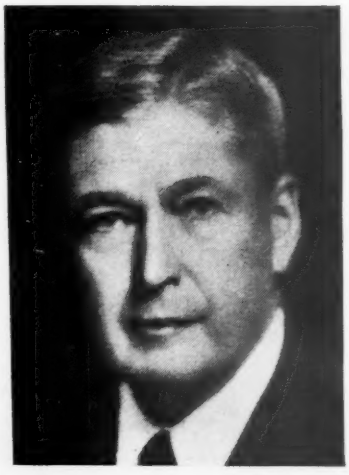
In accepting responsibility of world leadership we Americans must demonstrate our own national unity. One place where this can be demonstrated is in employer-employee relationships. Those engaging in collective bargaining, and endeavoring to settle their disagreements, must approach their negotiations with the realization of their responsibility, not only to the people they represent, but also to their country.

A Look at Your Earnings Record

ALAN H. TEMPLE

Vice-President, National City Bank of New York, New York, N. Y.

A comparison of electric utility earnings with those of other major divisions of business in the different phases of the business cycle, considered from the standpoint of long-term growth, relative fluctuations of operating revenues and net income, control of expenses, and other pertinent factors in the investment rating of utility securities.



Recent Markets for Electric Utility Securities and a Look to the Future

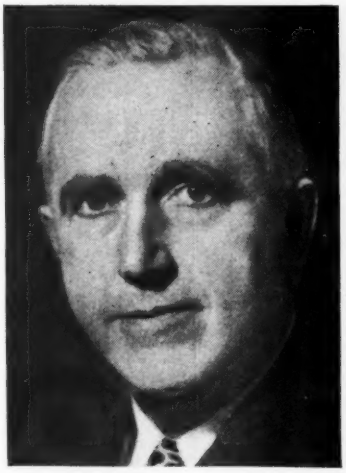
EDWARD HOPKINSON, JR.

Partner, Drexel and Company, Philadelphia, Pa., and Past President of Investment Bankers Association of America

The change from a seller's to a purchaser's market and the styling of new issues to best take advantage of these changing conditions.

THIRD GENERAL SESSION
Wednesday, June 2—2 P. M.

Broad Economic Trends as They Affect the Utility Industry



DR. LIONEL D. EDIE

President, Lionel D. Edie and Company, New York, N. Y.

The over-all demand for electrical energy as influenced by the level of production and of income payments; the outlook for capital expenditures in all industry and in the utility industry in particular; the problem of raising new capital and the extent to which this problem is influenced by the change in the value of the dollar; the impact of these factors on rate structure.

Thirty Thousand Hours a Minute

GWILYM A. PRICE

President, Westinghouse Electric Corp., Pittsburgh, Pa.

Current and near-future trends in industry, with emphasis on those of special interest and potential benefit to electrical utilities. Steps which seem to give greatest promise of producing economic climate most favorable to continued healthy progress.

Taxes and the Stockholder

LEE P. STACK

Vice-President, John Hancock Mutual Life Insurance Company, Boston, Mass.

Present federal tax laws, including double taxation of security holders, have a depressing effect on the capital raising powers of business enterprise. What can be done to lessen obstacles to healthy expansion—from the viewpoint of the holder of senior securities of corporations interested in a proper cushion of sound junior securities.

FOURTH GENERAL SESSION
Thursday, June 3—10 A. M.

Prize Awards Report

H. M. SAWYER

Chairman, E.E.I. Prize Awards Committee

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The Utilities and the Community

A. C. SPURR

President, Monongahela Power Company, Fairmont, West Virginia

The responsibility of the electric power company to the community and the benefits to be gained by the company through active, intelligent participation in community development. Mr. Spurr's address will include a résumé of what some member companies are now doing to foster community relations.

The Utilities' Stake in Conservation

DR. H. H. BENNETT

Chief, U. S. Department of Agriculture Soil Conservation Service, Washington, D. C.

The progress and urgency of soil and water conservation as a national undertaking, not limited to farmers but directly affecting pocketbooks and welfare of business and public in general, with emphasis on siltation and flood control.

Leadership in Accident Prevention

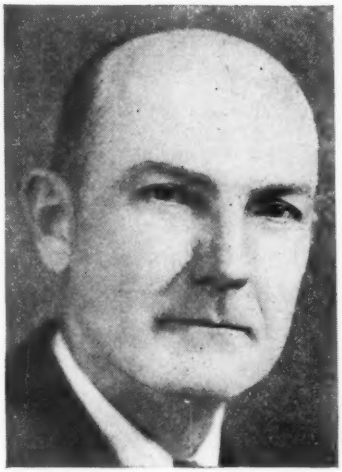
A. T. O'NEILL

President, Buffalo Niagara Electric Corp., Buffalo, New York

Of late years there has been an upward trend in accident frequency and severity in the industry. Mr. O'Neill, who has participated actively in accident prevention work, will discuss the urgent need for reversing the present trend: Lives, injuries, suffering, economic loss to employees and companies will depend upon the meeting of the problem.

FIFTH GENERAL SESSION
Thursday, June 3—2 P. M.

The Future—A Challenge



J. B. THOMAS

President, Texas Electric Service Company, Fort Worth, Texas

What to do to hasten and integrate application to the electric industry of the immense progress in engineering and physics. Implications of the predominant part that service and money costs now have and the need for a new philosophy of rate structure and commercial policy. The progress that has been made in the community acceptance of public utilities and their management and the opportunities that lie along that line.

Selling Selectively Now for Maximum Future Benefit

GEORGE E. WHITWELL

Vice-President in Charge of Sales, Philadelphia Electric Company, Philadelphia, Pa.

A realistic look at today's electric utility selling and sales organizations, particularly with reference to: the industry's large capital expansion program and its financing; the industry's responsibilities as a part of the national economy; and the industry's obligations to its employees and customers.

Sound Rate Design in Tomorrow's Economy

E. N. STRAIT

Chairman, E.E.I. Rate Research Committee and Manager, Rate and Research Division, Pioneer Service and Engineering Company, Chicago, Ill.

The importance of equitable rate forms as simple as economic requirements will permit. A practical analysis of rate construction for present and future conditions with the view of assuring a fair and adequate return to the investor with fair and non-discriminatory charges to the customer.

COMMITTEE MEETINGS
Tuesday Morning, June 1st

Open meetings of the following Committees of the Institute will be held Tuesday morning, June 1st at the Hotel Traymore. Convention delegates and guests are invited to attend.

Accounting Division General Committee, 9:30 A. M.

H. B. HARDWICK

Chairman, Presiding

This meeting will offer an opportunity for a full and free discussion of two subjects of vital current interest to the electric light and power industry. These are the financing of our mammoth construction program and the simplification and clarification of financial reports and statements. The first subject will have for discussion leader, H. H. Scaff, Vice-President, Ebasco Services, Inc.: the second, Leonard Spacek, a partner of Arthur Andersen and Company. Both subjects will be discussed from the floor.

Commercial Division General Committee, 10:00 A. M.

RALPH P. WAGNER

Chairman, Presiding

This meeting will be devoted to the consideration of the current promotional programs of the Edison Electric Institute. Included in the agenda is the new Electric Kitchen Program which is now in the process of preparation for release in the fall of 1948. Subjects and discussion will be handled in a manner that will be of interest not only to commercial executives of electric utility companies but to others in executive capacities in the industry.

Engineering Division General Committee, 10:00 A. M.

P. H. CHASE

Chairman, Presiding

Discussions of The Engineering Graduate and the Electric Utility Industry by H. K. Breckenridge, and the Work of the AEIC-EEI Joint Committee on Branch Circuit Protection will be features of this meeting. The year's work of the Engineering Committees and programs for the future will be reviewed by the Chairmen of the Electrical Equipment Committee, the Hydraulic Power Committee, the Meter and Service Committee, the Prime Movers Committee, and the Transmission and Distribution Committee.

Inflation and the Utilities

By N. E. Funk

Executive Vice-President, Philadelphia Electric Company

An address presented before the Maryland Utilities Association Annual Meeting at Baltimore, Maryland, on April 2, 1948

THE discussion of this subject, for several reasons, is confined to the privately-owned electric utilities, the manufactured gas operating utilities, and the district steam heating companies. First, because I have been requested to limit myself to that field; second, because I am not conversant with conditions in other utility services; and third, because even if I were familiar with the broader subject, sufficient time is not available for the presentation.

Approaching the problem nationally, I found myself confronted with a maze of figures which lend themselves more to individual study than delivery from a platform. If, however, index numbers are used, the information falls into a pattern that indicates clearly the various phases of problems faced by the utilities.

National Statistics

I shall use the year 1940 as the base year and shall relate the years 1946 and 1947 to it by index numbers obtained from the national statistics of the industries. The information relating to the electric utilities has been obtained from Federal Power Commission Electric Power Statistics, U. S. Department of Labor, Edison Electric Institute and the *Electrical World* for the years 1940 and 1947. The American Gas Association was the source of the gas utility statistics and, since information was not available for the year 1947, data for the year 1946 were used for comparison with 1940.

National statistics must be used with caution. The operations of the individual companies will vary materially from the summated components making up the national total. The effect of changing conditions as applied to individual companies may not produce the same result when integrated as that obtained by using these same factors on the national figures. All that can be hoped for is the indication of possible trends that may act as guide posts for our thinking.

Since the year 1940 we have seen the cost of almost everything in this country increase, slowly at first, but with great rapidity during the last two years until the price index now stands at from 160 to 200, depending upon the commodity. During the same period the revenue of electric utilities per kwhr sold has decreased to an index of 92 for 1947 and the revenue of the manufactured gas utilities per 1,000 cu ft of gas sold to an index of 94 for 1946. This seems to have been accepted as a matter of course, with little or no thought given to the fact that the costs of doing business of these utilities were increasing along with those of all other industries.

It is probably difficult for many people to understand why, in the last year or two, many district steam heating companies have asked for and received rate increases and numerous other small heating companies actually ceased operations entirely, whereas they had been able to continue in business during the war period at their old rates. The same thinking applies to gas companies, which also have received increases in rates but, in general, not sufficient in amount to cover the increased costs they have experienced.

Utility Rate Increase

Assuming that the peak of prices is past, how much more difficult it will be for the public to understand why the electric utilities should need increased rates with prices on the down grade. This, however, is a possibility that is not too remote.

Let us turn to the gas utilities again to see why they obtained rate increases when the electric utilities did not. The indices for gas utilities in 1946 were: 135 for sales, 128 for revenue, 137 for operating expenses, including depreciation and taxes, and 91 for gross income. In other words, although the amount of 1946 business was 35 per cent greater than in 1940, the gross income was 9 per cent lower. The ratio of expenses to revenue was about 81 per cent in 1940 and 87 per cent in 1946. In addition, the return on the gas properties in 1940 was about 1.5 points lower than for the electric properties.

It is very easy to see why the gas properties were among the first to feel the squeeze of increased costs—their margins were so small. The steam heating utilities entered this inflationary period in a worse position than the gas industry, since the return on their property was even lower than that of gas.

The question naturally arises as to why the electric utilities have not followed the same pattern. The answer is that in general they have, but for various reasons the result has not been so severe.

Index Records Compared

As a first step, let us look at the index record of electric utilities for 1947 compared to 1940. The total kwhr sales increased to 164, while the operating revenue increased slightly less, to 152. The total operating expenses increased to 189, with a fuel cost index of 293 and a labor cost index of 167. The increase in the fuel index reflects both increased use and increased price, while the labor index is almost wholly due to wage increases. The index of charges against revenue for depreciation of 130 is in step with the index of electric plant investment of 127, while the index for taxes of 161 is nine points higher as compared with the index for revenue of 152.

By totalling all charges, including depreciation and taxes, we find that the index of these deductions has increased to 173 with a resulting electric operating income index of 102.5 to pay for an electric plant investment of 127, an increase of 2.5 per cent in income with which to pay for a 27 per cent increase in investment. This, however, was accomplished in part by a material reduction in the interest charges on long-term debt, the index of which in 1947 was 71 which, together with other income and other deductions from income, resulted in a net income index of 117 in 1947, and in part through the utilization of funds from the retirement reserve account and surplus.

This is the story for 1947, but it does not stop there because, apparently, the period of low return on money is at an end, and hereafter the interest on long-term debt will in all probability increase. It should be borne in mind too that since much of the financing in the past has been with bonds and preferred stocks, many

utilities are now finding themselves in a position where additional financing will have to be done through the sale of common stock, which obviously requires a higher remuneration than that required by the senior securities.

There are other factors that do not appear on the income statements or balance sheets of the electric utility industry which are probably even more indicative of the trend of future costs than the financial statements of the past.

Capacity Reserves

The first of such items for discussion is the capacity reserves available on the systems. On a national basis, the industry had between 26 per cent and 30 per cent reserve in generating capacity in 1940 which decreased to about 5 per cent in 1947. There is no national yard stick to measure the capacity reserves in the transmission, transformation, distribution and general plant of the industry, thus there is no means of determining with any degree of accuracy the relation of reserve capacity between the generating systems and the other service facilities. We do know, however, that in general the systems are usually quite well balanced and that in the past there was a reasonable amount of leeway existing to allow for growth and for the time required to install additions.

During the war period no facilities were added that were not absolutely necessary. There are many instances where generating capacity and transmission lines were installed to supply some specific war loads which either were materially reduced or disappeared entirely with the termination of the war. The subsequent growth of the general load necessitated the addition of new distribution facilities to utilize the generating capacity if not the transmission lines made available by the reduction or disappearance of war loads.

After the war, the difficulty of obtaining new equipment was equally great for all departments of the supply systems, so that it is reasonable to assume that the generating capacity reserves of the production systems are generally indicative of the reserves available in the other functional subdivisions of the systems.

Let us turn now to a review of the facts surrounding the investment in the electric utility plant on a national basis from 1940 to 1947. The indices in round figures for 1947 were 127 for plant investment as compared to 122 for generating capacity, indicating that the cost index of the additions in that period has been 125 which may be too low, because during the same period the plant accounts have been restated on an original cost basis, thus eliminating acquisition cost and other values formerly reflected in these accounts. Thus the simple numerical difference between the 1940 and 1947 investments in plant accounts does not in itself indicate the true increase in the cost of plant additions. This figure, however, is the only national information that seems to be available; therefore, we will use it to make an estimate of the investment in plant for 1947 that would have resulted had the utilities been able to preserve a capacity reserve of 15 per cent. Under this assumption the estimate of the capacity index becomes 133 instead of 122 actually experienced, and the resulting plant investment becomes 142 instead of 127 reflected by the records for 1947.

This shows that if it had been possible to maintain the desired reserve capacity, and with all other things equal, the electric utilities on a national basis would have had only 2.5 per cent increase in operating income to pay for a 42 per cent increase in plant investment.

I realize that this is a very crude method of making an estimate and that the investment of the entire plant may not parallel that of the generating stations but the figure is presented only to give an approximate indication of one trend that cannot be evident in the financial statements.

However, this increase in plant investment did not occur in the period under discussion. It was only through diligent management that electric utilities were able to furnish service even though seriously handicapped by insufficient capacity reserves. This situation will not continue. New additional plant is being installed as rapidly as material and equipment can be obtained and put in service. Thus the trend indicated above in the cost of additional facilities will be exaggerated as plant additions are made under the existing high prices.

What the Future Holds

Let us look in our crystal ball to see what the future may have in store for us. We cannot expect to see the hourly rates of labor reduced materially but, if history is to repeat itself, we have every right to believe that production per manhour will be increased either from greater applications with the existing tools or, if this does not occur, from the installation of more productive tools. Whatever the cause may be we will assume that the price index for future plant additions will be 160 of the 1940 index. Correcting this to the 1947 total investment in plant of electric utilities as a base of 100 per cent produces an index for the future of 153.

What will be the index of plant investment in the year X when the output of the utilities has attained an index value of 150 compared to the 1947 output, realizing that sufficient capacity must be installed not only to carry the increased load but also to result in a reserve capacity which will be assumed at 15 per cent for this discussion?

Remembering that the reserve capacity for 1947 was 5 per cent, we find that the index of installed capacity for the year X is 164 and the index of investment in plant 198. Both these indices have increased to a greater extent than the index of increased business, namely 150.

The picture is not complete without knowledge of the increase in operating income that is obtained from the assumed increase in output.

Reproducing the estimated operating income on a national basis is a very complicated procedure necessitating so many assumptions and guesses that the result is open to question; however, again using our crystal ball, let us see what follows. We will assume that the revenue index is the same as the load index, namely 150 and the fuel index is 142.5 or 95 per cent of the output index. The year 1947 did not reflect the full effect of increase in fuel prices and it seems probable that there will be further increases in the cost of freight and fuel but we will discount all of this by assuming that the increase in plant efficiency and improvement in fuel quality will not only cancel the above increases but result in a cost reduction of 5 per cent. This may appear too optimistic in view of the small improvement in fuel consumption of only 3 per cent from 1940 to 1947. However, all of the added capacity will be highly efficient and the amount will include not only the capacity to supply the new load but that necessary to establish a satisfactory reserve. The older and less efficient equipment will be assigned to reserve duty and the new equipment will supply the output. Note that the entire increase in output of the privately owned utility systems has been assumed to be supplied by steam plants.

Using past performances we may expect an increase in personnel of 10 per cent and, assuming additional wage increases of 7 per cent, we arrive at a labor index of 118. Other operating expenses appear to have had a fairly constant relation to the output but we will assume that

we can reduce this index to 140 for the 150 load index.

There are two other factors that must be considered, namely, charges for depreciation reserve and taxes. The first item should be in proportion to the installed plant and the index is therefore 198; the second item is anybody's guess but we will assume that the index is 155, increasing less than the 1940 to 1947 tax index did, for a revenue index of 152.

By applying these indices to the respective items of the national reports of the industry for 1947, we obtain a national index of 171 for electric operating income. This index may be high since most of the cost indices used have been assumed conservatively and any increase in them would reduce the operating income index rapidly.

We are therefore faced with the probability that some time in the future the industry as a whole may find itself with only a 71 per cent increase in operating income to pay for a 98 per cent increase in plant investment.

True enough, this is an oversimplification of the problem inasmuch as during this period some property will be retired and must be replaced with much costlier facilities and some of the additions will be financed from the retirement reserve account, but I am sure you will agree with me that enough assumptions have already been made without adding any other elements to confuse the formula.

Please remember that I have only tried to apply some arithmetic to crystal gazing. I hold no brief for the accuracy of the resulting figures but believe that they do demonstrate why the great increase in price indices is going to exert a continuously disturbing effect upon the operation of the electric utility industry when other types of industry may have reached a stabilized position through price increases of their products to meet increasing costs of operation.

Plant Investment

The investment in manufacturing plants varies over a wide range, depending upon the type of industry, but a fair average is one dollar of plant investment for every dollar of operating revenue. Assuming, merely for the sake of argument, that 94 cents of every dollar of revenue is required for all operating expenses, then 6 cents is left to pay a 6 per cent return on the one dollar plant investment. If costs increase 10 per cent, the 94 cents now becomes $1.034 and the manufacturer is in the red to the tune of 3.4 per cent of his capital. He must either increase the sales price of his product by 9.4 per cent or find himself in the hands of the sheriff. The effect of increasing costs is immediately reflected in operations of this type.

The electric utility industry under normal conditions will have about $5.00 invested in plant for each dollar of revenue. This results in a requirement that only 70 cents of each dollar of revenue will be used for operating expenses leaving the remaining 30 cents to pay a 6 per cent return on the $5.00 invested in plant. If the utilities' operating costs increase 10 per cent then 77 cents of each dollar of revenue is used in operating costs leaving 23 cents to pay a 4.6 per cent return on the plant investment. The utility industry would be badly bent but not in as serious a position as the manufacturing industry. The effect of increasing cost is not evident as immediately or as drastically.

Over a long period, however, increases in plant investment costs do not have as serious effect upon the total cost of the manufacturer because only from 6 per cent to 10 per cent of his total costs are affected, whereas, at least 30 per cent of utility costs are involved with a resultant greater increase in income taxes which, of course, further increases operating costs.

Electric Utility Rates

The question may very justifiably be asked why the electric utilities for years have been able continuously to reduce their rates even during periods of inflation and now, for the first time, may be in a position where the trend of rates should be somewhat reversed. There are many reasons why present day conditions differ. System annual load factors have been continually increasing to a point where, if they increase much more, it may be necessary to install additional capacity to permit satisfactory maintenance of equipment. Thus, the advantage of an ever increasing load factor is gradually diminishing as an element of unit cost reduction.

Someone may argue that the kilowatthours produced per kilowatt of installed capacity has increased 36 per cent from 1940 to 1947, and, therefore, a similar increase should be expected in the future even though it might not be as great. If this percentage is corrected for the excess reserve of 1940 and the limited reserve of 1947, it will be found that the increase actually is only 13½ per cent and further increases of any major amount in this factor may be limited by maintenance requirements.

As better materials have made their appearance the limits of the heat cycle have been extended so that a thermal efficiency of over 30 per cent is now possible. Knowing that approximately 50 per cent of the heat in the fuel is discharged at the low end of the thermal cycle and that improvement in this is limited by circulating water temperature and the size of the passages of the exhaust end of the turbine, it does not take a very vivid imagination to realize that the possibility of improvement in plant efficiency is not nearly so great as it was twenty years ago.

Beginning with the years previous to World War I, there has been a continuous improvement in production efficiency of steam power plants. This has been widely publicized from time to time in both the technical and lay press, and has resulted in a general feeling that the technical improvement in the generation of electric energy has played a major part in the ability of the electric utilities to continuously reduce their rates. As a matter of fact, this never was so until after 1926 because until that year the increase in cost of fuel delivered either kept pace with the increased system plant efficiency or more than offset it.

From 1926 to 1929, a decrease in fuel cost per kilowatthour occurred resulting both from improved efficiency and a gradual reduction in fuel price, and then the bottom dropped out of the fuel prices. There was a material reduction in the fuel cost per kwhr at this time which was brought about almost entirely by the lower price of fuel. From 1934 to date there has been a continuing increase in fuel prices until, in 1946, the fuel cost per kilowatthour was greater than before World War I. There are no national figures presently available of which I am aware, extending back to a period before World War I. I shall, therefore, use as an example, to illustrate this situation, the facts that lie directly within my memory in the operation of my own Company's system.

Plant Performances Compared

Previous to 1915, we were able to purchase fuel at a total cost per net ton delivered that was materially less than the present cost per ton of freight alone for the shortest freight haul of bituminous coal that we now experience. At the old Schuylkill plant, which then had a total capacity of slightly over 60,000 kw, we produced a kwhr for less than four mills operating cost at a load factor of less than 40 per cent.

In 1947 we were not able to duplicate this performance with the best station on

the System with a capacity several times that of the old Schuylkill No. 1 Station and operating at a higher load factor. In other words, the entire thermal improvement that we have been able to design into our latest generating stations has more than gone to pay the increased bill of the coal man, the railroad and our own labor. This is also true for the total production costs including return on the investment in generating stations, which have reached a sufficiently higher cost per kw—because of increased construction costs over that of the old station—to at least offset the advantage of improved load factor.

Ever increasing size of generating units and improvements in manufacturing technique have been responsible for reduction in investment and operating costs below what they would have been with smaller units, but this factor is approaching a limiting value where further increases in size will not result in material reduction in unit costs.

There will be an improvement in overall system production efficiency as the new installations become an ever increasing proportion of the total installed capacity, but we cannot expect the same reduction in the fuel rate that was experienced in the ten years previous to 1935.

The reduction of utility rates has come about primarily because of the tremendous improvement in customer density, load factor, diversity factor, and an increase in volume which have materially augmented the use of the transmission and distribution system, and reduced other costs of conducting business thus permitting the unit cost of delivery to the customer from the production system to be continually decreased.

The reduction in unit cost of the delivery system per kilowatthour experienced in the past may not be present to the same extent in the future, partly because most of the excess load-carrying ability that was built into these systems, because of mechanical strength requirements, has been largely utilized by the increase in loads in the past, and partly because now that the territory served by the industry has been generally well covered with transmission and distribution facilities, any further increase in such load densities will require the provision of additional facilities almost in proportion to the increase in load, and load factors have now reached such magnitudes that any foreseeable improvement therein will be small in relation to the increases experienced in the past. Furthermore, the additional facilities required by the increases in load densities will be provided at much higher construction unit costs than existed in the past, and this, coupled with increased costs of labor and materials for the operation and maintenance of these systems, leads to the unavoidable conclusion that not much, if any, economies in unit costs per kwhr of service rendered can be expected in the immediate future.

Technical Margin Disappearing

These changes are indicative of the fact that the large margin of technical improvement that was available in the earlier years has gradually been disappearing so that inordinate increases in the cost of basic materials cannot be easily overcome.

I have attempted to present an analysis of the trend of present day conditions. When the whole price level of the nation has been increased from 50 to 100 per cent, it seems quite unreasonable to contend that one section of the economy should continue to exist below a pre-inflationary price level. Do not think for a moment that I believe that there is no possibility of improving the present operations of the electric utilities. Increased price levels are always productive of engineering developments that may be uneconomical at a lower price level, and with the continued increase in electric energy output there is no doubt in my mind but that we will find methods of overcoming the effects of these high prices as time goes on. However, the transition in price level has been so rapid and, apparently, will continue to persist at the new level for some period of time, that developments to overcome this effect on the rate schedule cannot be made with the same rapidity that took place in the price change. To maintain the financial integrity of the electric utility systems, it may be necessary to have increases in their prices at least for a period of time until the new level of costs can be offset by new methods of procedure.

Unlike the supply of gas or steam, the supply of electric energy has a tremendous advantage in its favor, namely, the great diversity of its use. Practically every worthwhile service in the home can be achieved at modest cost by the use of electric energy except space heating, and should it be possible to develop the heat pump so that it can economically supply this service, even that limitation may be removed.

Electricity in Industry

In industry, all types of equipment are driven by electric energy, and new methods of utilization for melting, heating and drying of materials are continuously being developed. For example, the use of infrared light for drying paints and enamels has speeded up production and cut down the floor space required by manufacturers for finishing their product. Developments in electronic heating have not only improved manufactured products but have, almost miraculously, reduced the time of specific operations. The field of electronic devices for control of new applications in electric power is just coming of age. It is improbable that our imagination can now encompass the new automatic processes that will appear in the future to increase production per manhour.

Central station service is progressively replacing isolated plants. Manufacturers have come to rely more and more upon its all season reliability and other outstanding advantages. If the nation is to continue to increase its application of power per manhour as a means of increasing production, everyone in the nation should be in accord that the financial stability of the companies producing that power should be preserved.

Northwest Electric Association Moves Research Advisory Service to Portland, Ore.

THE Northwest Electric Light & Power Association has brought its Research Advisory Service from Spokane, Wash., to Portland, Ore., and combined it with the Portland office of the Association in new quarters at 204 Corbett Bldg., it is announced by Berkeley Snow, executive secretary of the Association. Ladner V. Ross, director of Research Advisory Service since its inception in the Northwest, has moved to Portland and continues to direct the service with a new staff recruited from Portland people.

Research Advisory Service is offered to the utility company members of the Association who make it available to their industrial and business customers to answer questions in production, processing, marketing, packaging, and the like. Problems are sent through the utility companies to the central office in Portland, which seeks answers from appropriate research laboratories, colleges, trade associations, government organizations, and other institutions with which contact is maintained for this purpose.

Technical Aid Improves Infrared Performance

By F. J. Jolly

Industrial Heating Engineer, The Detroit Edison Company

DURING the past decade electric infrared has been established as a sound method for accomplishing rapid heat transfer in a number of industrial processes. Continued advances in equipment and technique have resulted in new applications and improved performance on processes to which infrared was applied earlier in its history. There are now many channels through which information of this nature may be currently directed to interested parties, but the following discussion is not intended to serve in such a capacity.

The purpose herein is to review past practice to learn what additional steps may be taken to maintain the steady progress that has been characteristic of infrared since its introduction a decade or so ago.

Infrared is essentially an industrial tool that finds its best application in mass production processes, i.e., processes involving large numbers of similar parts requiring essentially the same treatment. Operations are usually conveyorized and the oven length, conveyor speed, and distribution of lamps within the oven are designed to give the required "time-temperature" curve coincident with the desired production rate. Consequently, ovens are generally purchased on the basis of producing a given number of specific parts per unit of time at a pre-determined time-temperature curve or its equivalent.

High Reputation for Careful Engineering

Careful application of engineering principles and practical experience must be combined in the oven design to produce the anticipated results. Actual results are usually field-checked by the oven manufacturer after installation to insure satisfactory performance. This procedure has resulted in many highly satisfactory ovens installed throughout the country and has contributed materially to the acceptance accorded the electric infrared process by industry in general.

However, product designs are never static and, from time to time, changes are dictated by competition, public acceptance, availability of materials or other economic factors. In some cases, these revisions are minor and as such demand little or no change in the variables incorporated in the original oven design, while in others, they may be so radical that considerable adjustment may be required. Consequently, we may find ovens which yielded highly satisfactory results at the time of installation, but which, at present, may not be producing best results because of changes in product or materials involved.

Adaptability to Fit New Jobs

Adjustment to suit a variation in the work at hand is characteristic of any high-production tool whether it is a welder, an automatic screw machine, or a forming press. All of these machines have adjustments which make them useful for handling a definite range of work within the limitations imposed by their original design. Most of these adjustments are familiar to plant personnel and, after some experimentation, the machines can be adapted to new jobs with little or no help from outside.

Infrared ovens, like other production equipment, are also built with inherent flexibility and have adjustments incorporated in their basic design. However, the manipulation of these adjustments may not be familiar to the average plant maintenance man. Some plants may not have the facilities or technique for quantitatively checking the results obtained by varying the available adjustments. In addition, there still seems to be some confusion among users of infrared ovens with regard to the basic principles of radiant heat transfer. As a result, changes are often made which do not produce anticipated results, and in an effort to get back into production with a minimum of delay, other changes are made which may or may not be correct or necessary. The final result, in some cases, is an oven operating at poor efficiency and producing mediocre results, although it may be inherently capable of excellent performance of the imposed requirements.

Time and experience on the part of oven operators will eventually go far toward eliminating such situations. In the meantime, most manufacturers are assisting their customers when such aid is required by revised operating conditions. However, a certain margin in the selling price is allowed by the manufacturer to cover a post-installation service. Ordinarily this margin, for competitive reasons, is limited to cover only the conditions for which the equipment was originally purchased although many manufacturers have given service beyond this limit as a contribution to advancement of the method in industry. Nevertheless in each case there is some point beyond which further service will involve a definite financial loss, and this point can be determined only by the oven manufacturer. Production changes adopted after this point has been reached may require extensive readjustment of the oven and serious difficulties may develop if the purchaser lacks the technical facilities for readily completing this operation.

In the interest of continued acceptance of the method and until advisory service is readily and reasonably available to users of electric infrared, the public utility may find it advisable to fill this need in cases where technical service from equipment manufacturers is not available.

What Can Be Gained

However, it should be definitely understood that adoption of such a policy in no way relieves the oven manufacturer from the responsibilities accepted in the original sale of the equipment. While, under certain circumstances, the power company may see fit to offer its assistance, in such cases the specific purpose of this service is to aid its customer in obtaining maximum efficiency from equipment which may no longer carry any definite obligation on the part of its manufacturer because of conditions beyond his control.

The benefits to be derived from this policy are mutual and quite obvious. The power company retains an increment of load which might otherwise be lost, and

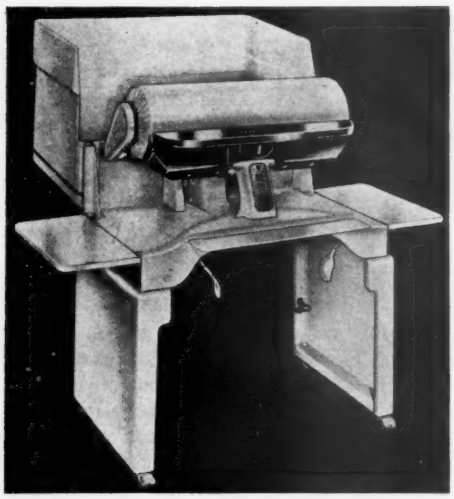


Fig. 1—A Completely Assembled Ironer as Produced at Factory "X." All White Parts are Baked in one Infrared Oven.

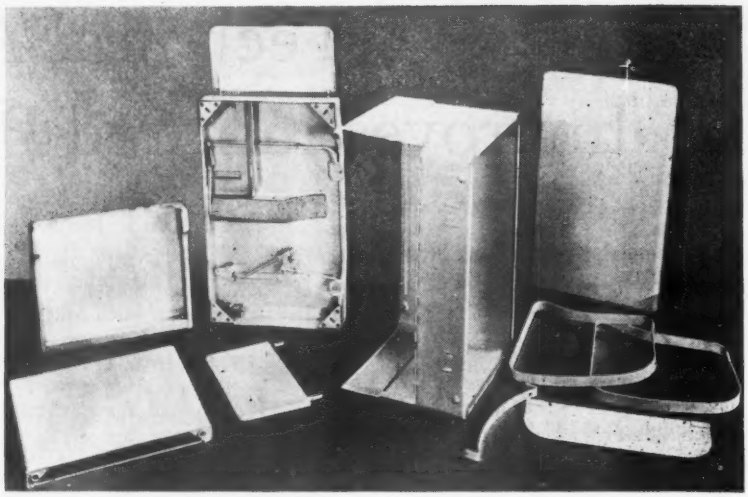


Fig. 2—Components of the Ironer Shown in Fig. 1, Displaying the Variety in Shape and Mass of Processed Parts.

as a result indirectly encourages acceptance of the method by others processing similar products. In addition, the customer is back in production with a minimum delay and has extended the period of return on a capital expenditure. Both these results cultivate a favorable attitude on his part toward possible applications of the method to other operations in his production process.

In order to demonstrate the results obtainable when such a policy is pursued, an actual example is described in the following paragraphs. In this case, electric infrared is used for paint baking—a process which led to its original introduction in industry and which probably has been its most common application up to the present time.

Operating Conditions

This particular oven is operating in a plant devoted solely to the manufacture of the electric ironer shown in Fig. 1. Production in the plant is set up so that completely painted parts arrive by conveyor at the assembly line precisely when needed. No floor space is available for storage of a large backlog of parts. Therefore, all of the individual components must pass through the oven in succession and consequently the oven must be designed to produce a satisfactory finish on a fairly wide variety of work. These components exhibit considerable variation in shape and mass, and the color (which is white) is the only nonvariable. These are shown in Fig. 2. The tops are No. 20 ga. steel; while all other parts are No. 18 ga. The base is the heaviest part because of its reinforced construction.

Unsatisfactory operation was being experienced and the management was seriously considering replacement of the oven with fuel-fired equipment.

Without going into detail on this phase of the problem, it was pointed out that a saving in fuel cost would amount to only slightly over 1¢ per ironer and, at that rate, eleven to fourteen years of operation would be required before any profit could be realized on the change. This was of sufficient consequence to convince the customer that electric infrared should be given another chance.

Temperature Tests

Fig. 3 shows the results of a temperature test on this oven in the "as found" condition. The wide variation in the temperature attained by the individual parts and the relatively short time these parts remained at maximum temperature can be noted. These conditions caused a wide variation in the hardness and durability of the finish obtained on the various pieces.

Subsequent changes led to considerable improvement in the finish obtained and some incidental suggestions on other phases of manufacture relieved additional problems in maintenance and operation.

Before describing changes in the oven proper, some discussion of the desired "time-temperature" curve is most certainly in order since best results are always obtained when the oven designer is cognizant of the limitations and requirements of the finish used. Close cooperation between the paint manufacturer and the oven designer is necessary to obtain best results from any installation and the importance of such cooperation cannot be over-emphasized.

In this case paints from several suppliers were being used and the maximum safe temperature of these varied from 300 F to 375 F. Discoloration and poor hardness were the chief complaints at the outset, although dirt particles on the work caused a considerable number of rejects. It was found that these different paints were being mixed and consequently the constituents that discolored at low temperature were present in all mixtures.

It was finally agreed that all suppliers would provide a paint that would cure with satisfactory finish if maintained for 3½ to 4 minutes above 300 F, but would not discolor at any temperature below 350 F.

Time-Temperature Characteristic

In order to obtain this "time-temperature" characteristic, a series of changes in the oven was recommended. The results obtained after these changes were made are shown in Fig. 4. It can be seen from these curves that the majority of parts settled into a band of about 10 F latitude which was quite close to the desired temperature characteristic. However, one part (the cabinet) ran very low, not even attaining a temperature of 300 F while another (the top) exceeded the maximum safe temperature and was discolored.

By a further change in lamping at the entrance end of the oven, which involved primarily a change in distribution rather than any change in total wattage, the cabinet temperature was increased so that it finally paralleled very closely that of all other parts except the top. This is shown on Fig. 5.

The top, however, still attained a tem-

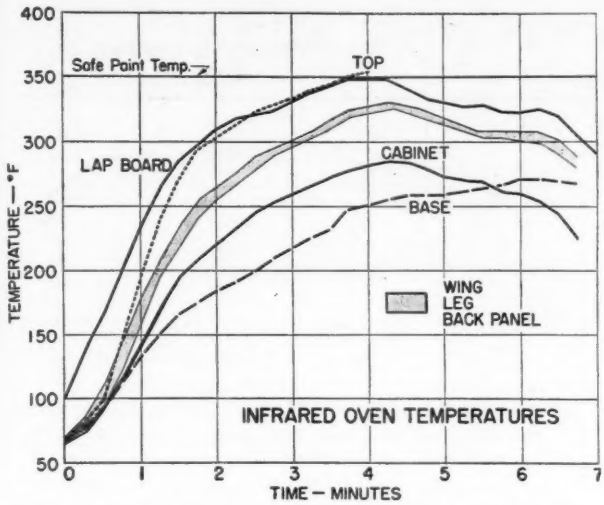


Fig. 3—Curves Showing the Temperatures Attained by the Various Components of the Ironer Before Corrective Steps Were Taken.

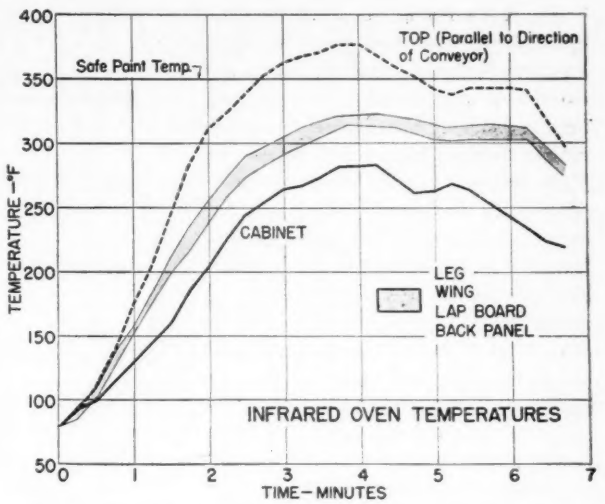


Fig. 4—Time-Temperature Curves Showing Results Obtained With the First of a Series of Recommended Changes in Lamp Wattage and Distribution.

perature too high for good results and any effort to decrease this temperature by reducing lamp wattages would surely depress the temperatures of other parts to the point where insufficient baking would result.

Two Solutions

The top, because it was fabricated of lighter gauge metal, resulted in a high ratio of energy absorbing area to total mass. Therefore, some means had to be devised to prevent this part from absorbing excessive energy without disturbing the balance obtained on the remaining parts.

Two solutions yielded satisfactory results. The first, shown in the curves of Fig. 6, was obtained by hanging the part in a position 45 degrees to the direction of the conveyor, a change that accomplished a reduction in absorbed energy because:

1. the projected area presented to a given number of lamps was reduced, and
2. the radiant energy, reflected from it, was controlled in such a manner that it was not thrown directly back upon the part by the reflecting surfaces of the oven.

Essentially the same curve was also obtained by hanging two of these parts back to back on the conveyor, thus reducing the amount of absorbed energy for each part by about one-half. The first method was finally adopted because of the resultant ease in spraying.

Final Temperature Curve

Finally, Fig. 7 shows the range of temperatures attained by all of the parts after final changes in the oven and the positions of the work on the conveyor were completed. The desired temperature curve was closely approached without exceeding the maximum safe temperature on any of the components and a satisfactory finish with respect to color, hardness, and durability on all parts was obtained.

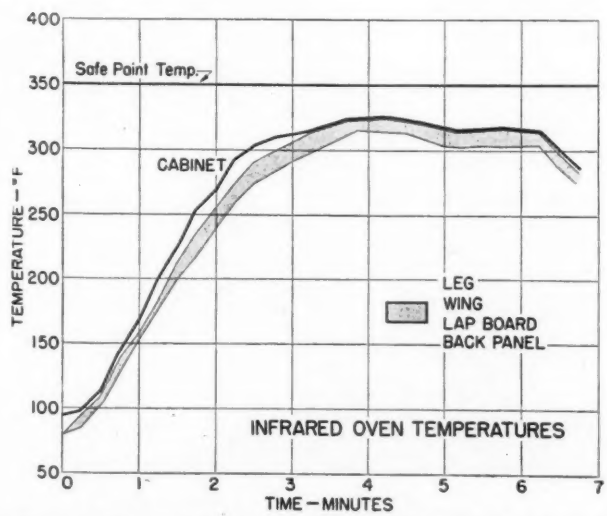


Fig. 5—Curves Showing the Results Obtained by Second Change in Energy Distribution Within the Oven. (Temperature Curve of "Top" not Shown.)

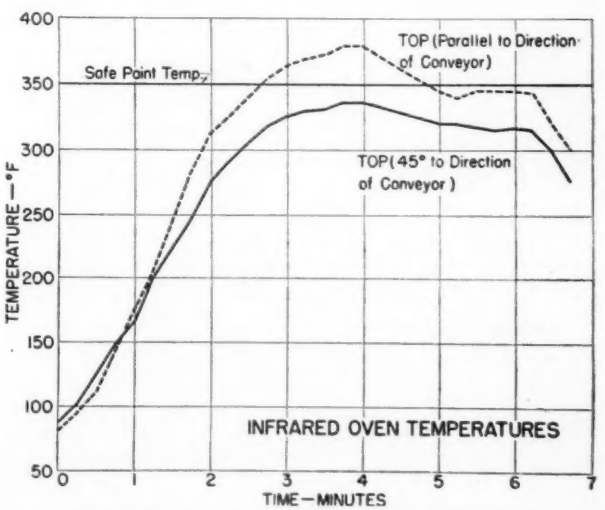

Safe Point Temp.
TOP (Parallel to Direction of Conveyor)
TOP (45° to Direction of Conveyor)
INFRARED OVEN TEMPERATURES
TEMPERATURE — °F
TIME — MINUTES

Fig. 6—Temperature Curves of "Top" Only, Showing the Effect of Changing the Position of the Part With Respect to the Radiant Oven Surfaces.

Fig. 8 is a photograph of the oven in its final position, suspended from the ceiling, a move which was recommended to save useful floor space, to aid in material handling and conveyor maintenance, and to remove the oven from a dirty zone in the plant that was causing rejects up to 15 per cent. A sheet metal covering now surrounds the conveyor and freshly painted work for protection against dirt particles. Five 90 deg. turns were eliminated from the conveyor and approximately 750 sq ft of floor space were freed for other purposes. The conveyor performance was improved to the extent that stretching of the chain links requiring week-end maintenance was eliminated in addition to some reduction in the power required to drive the conveyor.

Another view appears in Fig. 9 which shows the finished parts emerging from the oven and a portion of the assembly line. Assembly progresses to the left where finished ironers are packed for shipment.

The foregoing description illustrates fairly well how oven performance can be improved within the range of adjustments available in its original design.

Admittedly, cases may arise where product changes are so radical that the alterations required exceed the adjustments available in a particular oven. In such cases, the existing equipment sections are almost 100 per cent salvageable and can be incorporated into a new design with no particular difficulty. Such major changes when necessary can be readily accomplished by contract with the manufacturer of the original oven or other qualified organizations.

In conclusion, it appears that electric infrared will continue to offer new possibilities of increased load, but some effort must be exerted to aid its users over rough spots that sometimes occur with product changes. The future growth of infrared will depend upon a firm foundation of satisfied users. As such, *they* are the best salesmen we have.

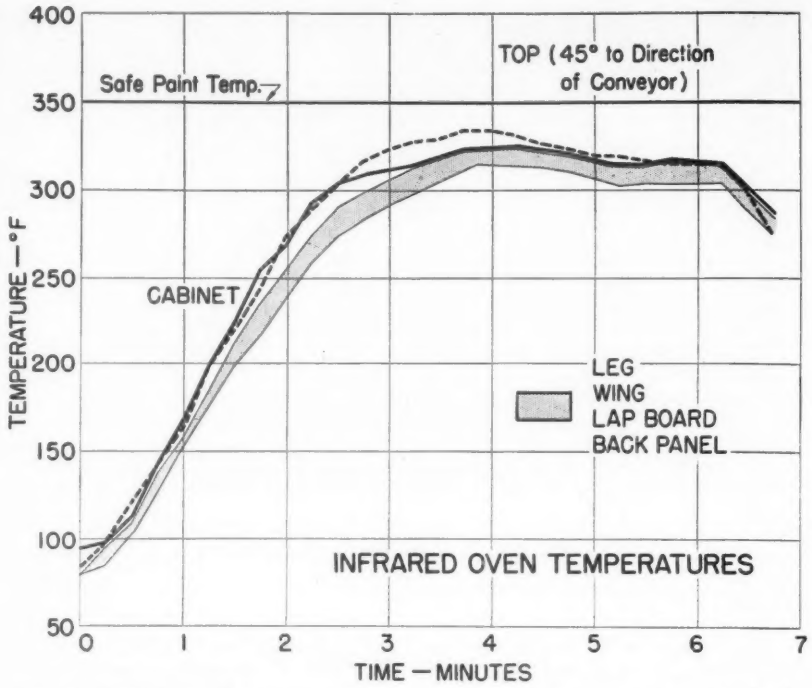


Fig. 7—Final Time-Temperature Curves for All Parts After the Final Changes in Lamping and Work Positions.

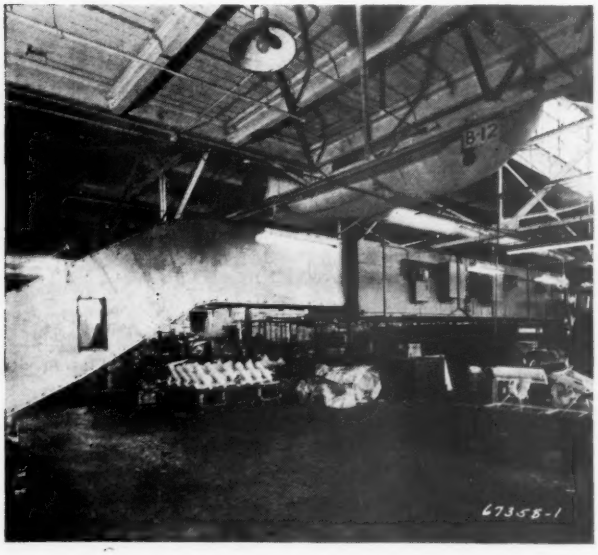


Fig. 8—View of the Infrared Oven in Its Final Position, Suspended from Roof Trusses. Note the Covering surrounding Conveyor at Entrance End of The Oven to Protect the Freshly Painted Work. The Oven Proper is at right above.

Fig. 9—Another View of the Infrared Oven Which Shows the Final Processed Parts Emerging from the Oven and a Portion of the Assembly Line Along Which Finished Ironers Move to be Packed for Shipment.

The Approach to Old Age and Retirement

By J. P. Flemming

Industrial Relations Consultant, Ebasco Services Inc.

A speech presented before the Personnel Administration Section Conference of the Southeastern Electric Exchange, at St. Petersburg, Fla., on January 9-10, 1948.

THIS study originated as the result of a question, "What do companies do to prepare their employees for retirement?" In other words, how is the employee's reluctance to retire overcome? Why isn't the employee satisfied to retire?

Research in industrial relations libraries, and among some industrial companies, disclosed that there were no records of any planned programs for preparing employees for retirement.

This research did, however, disclose some significant facts. Very few people want to retire. They do not want to think about retiring. They do nothing to prepare for retirement.

Figures on the labor turnover after World War II prove conclusively, according to Ewan Clague, Commissioner, Bureau of Labor Statistics, that most older workers, whether they are above or below 65 years of age, want to continue working as long as they can. They will not voluntarily retire from the labor force, but will withdraw only when they are forced out.*

What are the reasons for this?

Purpose of Pension Plan

Our study attempts to point out some of the problems management faces in dealing with older employees—and also some of the problems the older employee faces when he approaches retirement age.

We are indebted for much of our material to Dr. George Lawton, who assembled the papers of specialists who have dealt with the problems of the aging and published them in "New Goals for Old Age" †, and to Dr. Paul H. Landis, for his article "Today's Bargain: 16 Extra Years!" published in *Better Homes and Gardens,* for December, 1947.

The first question that arises in our minds is, why do we have pension plans?

Management has believed that the inauguration of a sound, equitably administered pension plan adds up to "good business" as viewed in the light of fair treatment to the older employees. Moreover, it has been felt that a pension plan results in the added contentment and loyalty of the younger members of an organization, in the knowledge that they too will be provided for when their productive years are over. Management has felt that the fact that a company has a pension plan is an added inducement to attract new employees, and to retain present employees.

Labor unions also have seen in social security and their own union pension plans a means of improving employment and promotional opportunities for their younger members.

Another reason for pension plans is that many industries had former employees who were receiving retirement payments under some informal arrangement. There was very little uniformity in the amounts of these payments, and this method was frequently unsatisfactory, and sometimes unfair to the individual involved. It also placed an unfair burden on the shoulders of those in management who had to decide how these cases should be treated. The pension plan, with its uniform funding methods, and with its uniform administration, provided an answer to this problem.

For many years industry has recognized the necessity of replacing machinery and equipment, and has, in accordance with good accounting practice, set up reserves to meet the cost of such retirements. By adopting pension plans, industry has recognized the need for meeting human obsolescence and depreciation, and has provided old-age retirement as a justifiable charge upon industry.

Lack of Understanding of Pension Plan

Management, and particularly utility management, has done a good job of setting up retirement plans, but many companies have failed to do a good job of informing employees about how these plans actually work.

Most employees receive, either when they first come to work, or, in some cases, if they ask for it, a neatly printed booklet explaining their company's retirement plan. But unless someone who knows the workings of the plan explains it to them in simple terms, the employees who read the booklet become lost in a maze of legal and technical language.

Here is an example:

> "Upon retirement on or after the attainment of age 65, a member shall receive an annual retirement allowance payable monthly at ½2th of the following annual amount. A retirement allowance based on compensation earned during Membership Service before age 65 equal to 1 per cent of that part of each month's compensation up to $250 plus 1½ per cent of that part of each month's compensation in excess of $250."

To dig out the meaning of the above clause requires some head scratching.

Simplified Retirement Plans

Eastman Kodak Company has done a creditable job on employee relations. This is how they explain their retirement plan to employees:

> "Kodak people who qualify for retirement annuity payments receive a check each month for life after they retire. The total yearly amount of these payments can be figured in each case by using the following formula:
>
> 1. Take 1 per cent of your total earnings, exclusive of Wage Dividends, during your continuous service with the Company up to your normal retirement date.
> 2. Then add 1 per cent of any earnings you have had in excess of $3,000, but less than $10,000, in any calendar years in which your earnings were in excess of $3,000.
> 3. One-half per cent of any earnings in excess of $10,000 in any calendar years would also be added.
>
> You receive the higher rate for earnings over $3,000 in any year because no Social Security benefits are allowed for them.
>
> Let's take an example to see how this formula works. Suppose you had worked for thirty continuous years at Kodak and your average earnings had been $2,500 a year. Your total earnings would amount to $75,000. Multiplying this figure by 1 per cent gives an annuity rate of $750. But you earned more than $3,000 in some years and the total amount

* Monthly Labor Review, December, 1947, page 662.
† Columbia University Press, New York.

> of your earnings over $3,000 in those years we'll assume to be $6,000. So you take 1 per cent of this figure which gives you additional annuities of $60. Altogether, then you are eligible for annuities amounting to $810. This means that every month for the rest of your life after retirement you would receive a check for $67.50 ($810 divided by 12 months) from Metropolitan Life Insurance Company. Since you will also receive Social Security benefits from the government, you should have an assured income of more than $100 a month for life in addition to the provisions you have yourself made for retirement."*

You will see from a study of the two examples above that the plans are very similar. Eastman, however, has explained its plan clearly.

Employees cannot—in fact they will not—appreciate the benefits of a pension plan until it is made clear to them what the benefits are. And employees will not welcome retirement unless they know what their pension payments are to be.

But, before Management takes further steps to inform employees about pension plans, there is a most important subject to be considered. That subject is the changing status of older employees.

Changing Status of Older Employees

In the days of ancient Greece, the average age at death was 29.4 years. In Massachusetts, around 1800, it was 35 years; in 1890, it had risen to 43. In 1935 the life expectancy in the United States went to 59.3. Today it is 65. Statisticians have made the thought-provoking prediction that in 1980 there will be in the United States 60,000,000 employable persons 45 years of age and over. That is thought-provoking because we are rather proud of the fact there are 60,000,000 employed today. What will happen in 1980?

It is very evident that as medical knowledge has grown, so has the number of years which the average person can expect to spend between the cradle and the grave.

Medical science has cut down fatalities from childhood diseases almost to the vanishing point. Sulfa drugs have provided cures for many previously fatal diseases of middle age. Today medical research is being organized to face the increasing problem of caring for the ailments of our aging population. These ailments are in the fields of degenerative diseases, usually associated with the process of aging. They include heart disease, high blood pressure, diabetes, kidney disorders, and cancer. When this research brings about the use of preventive measures to combat these diseases, the human life span will be further increased.

There are other factors besides medical science which have increased the life span.

From our factories have come forth a wide variety of equipment and gadgets—labor saving devices that have made our living conditions much less strenuous. The congregating of our population into cities has gotten us away from the rigors and the energy-consuming activities of country life. City bakeries, laundries and restaurants have relieved the housewife of many of her drudgeries.

In the face of this increasing life span can we say today that 65 is the proper age for retirement?

Before you try to answer that question, let us look at another side of this picture.

New Problems Are Created

While makers of false teeth, spectacles, and hearing aids are expanding their businesses, other industries, and the community as a whole, are having to face new problems created by the increasing life span.

Security for the aged is a political bonanza. The pension bandwagon has carried many a politician into office. Costs of medical care and hospitalization for the aged have grown heavier. The diseases of old age require extensive, wealth-consuming attention. This explains in part the critical shortage of doctors, nurses and hospital facilities.

These extra years are creating social and personal problems too. The aging employee wants this most important question answered: "How and Where Shall I Spend These Extra Years of My Old Age?"

In previous generations, the old had a place in the households of their children in most farm families. There they were useful — grandfather as chore-boy and general handyman—grandmother as baby-sitter and darner of socks.

But today the farm is not a refuge for the aged—less than a fifth of American families live on farms.

The city family seldom has a place for the elders. The city family is forced to place the needs of children above those of the grandparent, due to the fact that housing space is scarce and expensive.

Therefore, the retired person today has little to do but sit back and enjoy his forced leisure in loneliness. It is little wonder that he loses interest in life, and becomes senile.

We are forced to the conclusion that old people today should not be relegated to lives of suspended animation. The aged need part-time employment, recreation centers, arts and crafts centers, and workshops.

We shall have to develop many ways to utilize the judgment and experience of older people, whether it be in industry, or in advisory or teaching capacities. We must find some way of taking into account the increasing number of old people. If we do not, not only does the problem of management in taking care of its older employees become more difficult, but the problem of caring for the aged in the community, in the state, and in the nation, becomes extremely difficult.

Management Should Examine Pension Plan

Dr. George Lawton of New York City, a member of the New York State Advisory Committee on Problems of the Aging, stated recently that he believes that industrial pension systems must be revamped to recognize that retirement should be based on ability, not age.* In other words, he believed that an employee should not be retired when he reaches a certain age, but should be allowed to continue work as long as he is physically and mentally capable.

Perhaps Management should explore its pension plan to determine if 65 is the correct retirement age. Research and study will prove whether Management can afford to retire employees at 65.

Plan for Gradual Approach to Retirement

There is another suggestion that Management might explore on the question of retirement. It is the adoption of some form of gradual retirement for employees.

At some stated time prior to actual retirement age, the employee might be given, in addition to his vacation with full pay, a certain specified time off at reduced pay. This specified time off would be lengthened each year as the retirement date approaches. This plan would cut down on the employee's work days gradually and would allow him to spend more time on hobbies. No one can get accustomed to leisure over night. The reduced pay feature would gradually accustom the employee to living on his pension payments.

Another advantage of this plan would be the gradual breaking in of an understudy on the employee's job, so that when

* A Handbook for Kodak Men and Women—Eastman Kodak Co., Rochester 4, N. Y.

* From newspaper release, August 22, 1947, from Office of New York State Senator Thomas C. Desmond, Chairman of the Joint Legislative Committee on Problems of the Aging.

retirement day arrives, the understudy will have had training for his new job.

Consideration might also be given as to whether a gradual retirement plan could commence at the scheduled retirement age. If 65 were the scheduled retirement age, an employee, if physically and mentally capable, could work a specified part time the following year, and each year thereafter the specified work time would be cut down until the employee would be fully retired. Such a plan would not affect social security payments, which would be frozen at the full salary rate at retirement date.

These suggestions are matters for Management to refer to pension experts, to determine whether or not the company can afford to change its pension policy to take care of the increasing life span.

And now to answer the question which started this article. If you have a pension plan, what are you going to do to get your employees to accept retirement? How are you going to prepare them for it?

How Employees Can Be Prepared for Retirement

Let us understand at the outset that not every employee will welcome advice on how to prepare for retirement. Some independent souls will feel that it is none of Management's business. Others will refuse to be concerned about what to them appears like something that will happen only in the distant future.

The first step is to inform your employees that you are concerned about their future—a polite way of saying old age. This can be done by getting your supervisors interested in the problem. The supervisors will pass your ideas along to the employees reporting to them. Your employee publication can carry articles on how to prepare for the future.

Your employees must become concerned about their old age.

Every organization concerned with the happiness and satisfaction of its older employees should have on its staff one person of imagination, initiative, patience, and with a knowledge of the problems of the aging. This person should act in the capacity of counselor for older employees.

Planned Interview for Older Employees

The Metropolitan Life Insurance Company conducted a survey in 1933 to ascertain what provisions companies had made, or were making, with regard to older employees. The results of this survey were set forth in a publication "The Older Employee in Industry." One company reported that its employees are interviewed when they reach the age of 45 and every 5 years thereafter to determine if these older employees are properly adjusted, if they are performing on jobs beyond the limits of their physical condition, and if their health is normal.

Using this company's plan as a base, we suggest that a supervisor, working closely with the counselor, or perhaps the counselor himself, conduct interviews with older employees at stated intervals.

Before the interview is scheduled, the employee's supervisor will submit a report of his work. A report of a physical examination, stressing any tendency the employee may have to one of the diseases of old age, should be obtained. Any information the personnel records may reveal about the employee's dependents and other relatives and also information on the employee's absences because of illness, are useful in guiding the interview.

The first step in the interview would be to make certain the employee was familiar with the company's sick leave, disability and pension policies. Any questions the employee has about these policies should be cleared up.

Next, the report of the physical examination should be discussed. It should be brought to the attention of the employee that not all of the physical inadequacies of older people are due to the inescapable infirmities of old age. Much of it results from neglect of physical condition and failure to exercise. Older people should realize that the normal span of life can be stretched out considerably by the adoption of a diet, under direction of a physician.

Work Beyond Retirement

The third step in the interview would be a review of the employee's job performance, in connection with the physician's report, to make certain that the employee is physically able to carry on his job. Perhaps a change of jobs might be indicated. Today some of the larger and more far-sighted industries are making an effort to provide opportunities for older and handicapped workers to continue work. The Dodge Division of Chrysler Corporation and the Hudson Motor Car Company have special workshops where veteran employees who cannot maintain the necessary pace in other departments are eligible for transfer. In these workshops every man works at his own speed, and the job is adjusted to the man, not the man to the job.

It seems sensible to want to utilize the good judgment and experience of older workers. It is important to know that statistics show that older employees, because of their carefulness, are involved in fewer industrial accidents than younger people. Older men might well act as guides in safe practices.

Next, the interviewer should seek to learn what hobbies the employee is interested in.

Interest in Hobbies

Interest in a hobby provides mental stimulation both during a person's business life and afterwards during retirement.

A warning was issued on this subject recently by Dr. Clarence A. Neymann, Associate Professor of Psychiatry at Northwestern University Medical School. He stated that persons who planned, upon retiring, to give up all activities and thereby achieve what they suppose is unconfined bliss, may have to reckon with senile dementia. "No matter what social position or income a person has, it is a fact that life has a quick way of disposing of non-workers," the physician declared.*

If the employee has no hobby, an attempt should be made to interest him in one, either through the activities of the company's hobby club, or through fellow employees the counselor knows to be interested in a particular hobby, and finally through the hobby activities of the community, with which the counselor should be familiar.

Finally, the interviewer should lead the employee into a discussion of where he plans to live when he retires. It may be evident from the employee's personnel records that he has no relatives with whom he can live when retired, or discussion may disclose the fact that his relatives have no place for him. The employee's interest may be aroused about retirement in Florida or California, to those communities which cater to the aged. It is interesting to note that several communities throughout the country have been specifically designed and built to attract elderly people.†

A series of interviews with employees would certainly stimulate their thinking on the subject of retiring so that when the day comes when they are due to retire they will be prepared for it. And if they are not prepared, they will be forced to realize that the company did everything in its power to prepare them for retirement.

In conclusion, let us say again that this problem of the aged deserves much thought. Developments in caring for the aged should be watched carefully. This is your duty, not only as a business man, but as a citizen.

* Lecture—Chicago Medical Society, as reported in *N. Y. Times*, Nov. 16, 1947.

† Motion Picture Community Homes—*Architectural Forum*, November, 1942: Not Quite Heaven—*Saturday Evening Post*, May 9, 1942.

A Survey of Rubber Glove Practice

By I. R. Dohr

Member, EEI Accident Prevention Committee

SOME ten years ago a survey of the use of rubber gloves reported by the National Safety Council showed a wide divergence of practice in the industry. A more recent survey by the EEI Accident Prevention Committee indicates that during this decade the practice has tended to become more uniform. However, such practical factors as the operating voltage of distribution circuits, service conditions, type of construction, load density and many others, dictate to a certain degree each company's practice in the use of rubber gloves. As long as these factors cannot be standardized, it would seem over optimistic to think that rubber glove practice can be standardized completely. Standardization, however, is conducive to safety and it is and should remain a desirable objective.

Replies to the Committee's inquiry were received from 117 companies, although not all companies answered all of the questions. A summary of the more important items is given below.

Type of Glove and How Tested

The curved finger, type B, 14-in. glove is by far the glove most generally used. In regard to the routine test voltage, 10,000 v for a duration of from one to ten minutes is used by 75 per cent of the companies. Only two companies use d-c testing and the highest a-c test is 25-kv for one minute.

The frequency of routine test shows greater variation than test voltage. Of all the companies 54 per cent test monthly, 14 per cent every two months and 16 per cent every three months. The longest test period is annually, used by one company.

Maximum Voltage on Which Used

The following tabulation shows the maximum system voltages on which rubber gloves are used by the companies replying to this inquiry.

(a) Isolated neutral system (phase-to-phase voltage)

Maximum Voltage	
3,000 v. and below	25% of companies
3,001 to 4,000 v., incl.	12% " "
4,001 to 5,000 " "	36% " "
5,001 to 6,000 " "	0 " "
6,001 to 7,000 " "	15% " "
7,001 to 8,000 " "	12% " "

(b) Grounded neutral system (phase-to-ground voltage)

Maximum Voltage	
3,000 v. and below	61% of companies
3,001 to 4,000 v., incl.	9% " "
4,001 to 5,000 " "	20% " "
5,001 to 6,000 " "	1% " "
6,001 to 7,000 " "	2% " "
7,001 to 8,000 " "	7% " "

In using rubber gloves on any voltage the determination of policy must be predicated on two considerations: 1) Are the working conditions such that when conductor voltage to ground is higher than the 3,000-v rating of the glove, the voltage stress across the glove will not be unduly excessive because of auxiliary insulation—insulating platform, dry pole, etc.; 2) Are the environmental conditions such that work directly on and in close proximity to the energized conductors can be done with complete control of the hazards.

Industry experience as recorded below under "Failures of Gloves in Service" seems to give some indication of the fact that policy determinations are being predicated on proper technical analysis and the establishment of necessary safety practices and procedures.

Leather Protectors, and Liners

Only one company reported that leather protectors are not always required. This very necessary protection for the rubber glove is apparently very firmly established. Of the companies using the curved finger glove, 21 per cent use special protectors.

The practice in regard to the use of cotton or woolen liners varies considerably although 44 per cent of the companies have them available as optional and another 19 per cent use them in the winter. Of the companies, 35 per cent do not use them.

Failures of Gloves in Service

No failures were reported by 86 per cent of the companies and 14 per cent reported failures. A total of 21 glove failures were reported; 7 were due to mechanical failures (wire puncturing glove), 12 were due to electrical failures and in two cases the information was incomplete.

Two of the mechanical failures resulted in fatalities and one electrical failure resulted in a fatality. Three electrical failures resulted in electric burns and the remaining 8 caused minor injuries if any.

Five of the electrical failures occurred on 2,300 v, one on 4,000 v, three on 4,500 v and 4,600 v, one on 6,900 v, one on static voltage and one did not report the voltage. The fatality occurred in 4,600 v.

A number of the electric failures were at pinholes which an air test did not reveal. As noted above, five occurred on 2,300 v and four on voltages between 2,300 and 4,600, indicating that magnitude of voltage was not a serious factor. The meager information available on the failures indicates that the gloves quite likely were weakened or injured mechanically previous to the failure.

Linemen are urged and required to make careful inspection of rubber gloves before their use. This is approved procedure for most companies. A review of the electrical failures reported suggests the possibility that we may be overlooking the inspection of the inside of the leather protectors as a possible source of injury to the glove. A small metal sliver or chip in the leather glove could have been the cause of or contributed to some of these failures and have gone unnoticed. A copper sliver was reported as the cause of one failure. Foreign particles can unknowingly get inside leather protectors. As a standard protective measure linemen might be instructed to slip the bare hand into the leather protector and feel around for particles and shake the leather protector while on the hand, held in an inverted position, as part of the regular procedure in making the "air test."

Even though 21 glove failures were reported, it is reassuring to know that in all the hundreds of years of service represented by the responding companies, only one fatality resulted from an *electric* failure out of the thousands of gloves in use.

Damage by Corona Cutting

Although 5 per cent of the companies reporting indicated gloves had been damaged by corona cutting, the nature of the

(*Continued on page* 87)

Initial Survey of Heat Pump Research

Prof. Hadley Retained As Consultant to Joint AEIC-EEI Heat Pump Committee

INCREASED interest by individuals and manufacturers during the past few months regarding possibilities in the use of the heat pump has become of concern to the Joint AEIC-EEI Heat Pump Committee. Varied investigations have been initiated or are being planned by many research organizations throughout the country. Much publicity has been brought to public attention, and the desire to install this type of unit in residences and small commercial establishments, in all parts of the country, increases daily. Despite this publicity there are many problems yet to be solved before the heat pump will become universally applicable.

Heat Pump Committee Retains Consultant

At a recent meeting the Joint AEIC-EEI Heat Pump Committee announced the engagement of Professor William A. Hadley, of Columbia University, as Technical Consultant to the Committee on earth as a heat source. In this capacity, Professor Hadley will initiate a theoretical analysis of the transient heat transfer conditions occurring in the ground, to determine the rate of heat transfer to be expected during a heating season.

Professor Hadley is well qualified for such an assignment. At the present time he is in charge of the Heat Processes courses in the Department of Mechanical Engineering at Columbia. While at Columbia, and previously at the U. S. Naval Academy, Professor Hadley conducted numerical analyses of transient heat transfer conditions. In the work at Columbia, he has utilized the unique facilities of the Heat Transfer and Mass Flow Analyzer Laboratory.

The objective of the Joint Committee in sponsoring such a project is to obtain accurate fundamental design data on the ground as a source of heat for a heat pump system.

The preliminary analysis by Professor Hadley will be carried out initially for an average moisture content in the ground, pipe spacing and depth such that it is unaffected by the frost line or adjacent piping, and for constant evaporator pressure.

Results of the preliminary analysis will be correlated with current experimental data and employed as a basis for future analyses concerning the important variables which affect the use of the ground as a heat source for the heat pump.

The Committee feels that such an analysis will be both timely and valuable in correlating the research and development programs now under way. It will also help determine the most important additional research necessary.

Progress has been made on research projects and developmental programs concerning this phase of heat pump use. Several projects now under way, or planned for the future, by well-known Research Institutes or Universities throughout the country, are known to the Committee. The main objectives and a brief synopsis of each are given below.

Connecticut Light & Power Co.— University of Connecticut

The Connecticut Light & Power Company is sponsoring a project at the University of Connecticut, under the directorship of Professor C. H. Coogan, Jr.

The project, started in November, 1946, has several important objectives:

a. Determine the coefficient of heat transfer from the local soil to buried tubes

b. Study installation and operating problems of a simple heat pump unit

c. Study the effect of moisture content, density, and composition, on the thermal conductivity of the soil

d. Study the temperature distribution around buried tubes

e. Study the effect of the distance between the buried tubes

f. Study relative effect of distance below the surface on buried tubes

g. Study effect of the size of buried tubes

h. Study relative effect of the ground surface temperature at various distances below ground surface.

The compressor, condenser and expansion valve are located in the Mechanical Engineering Laboratory; the ground coil or evaporator is installed in the ground near the laboratory. Several coils of tubing will be buried together with other equipment necessary for making the study including temperature measuring devices.

American Gas & Electric Co.

The subsidiary companies of the American Gas & Electric Co. are continuing their research project on ground as a heat source for the heat pump. This project is located at the Tidd Plant of the Ohio Power Co. in Brilliant, Ohio. The program is directed by E. R. Ambrose and supervised by M. S. Martus.

The objectives of the program are:

a. Determine the expected rate of heat transfer from and to the ground using three different and distinct types of ground surfaces with various temperatures of the circulating liquid

b. Study the effect of circulating liquid temperatures below 32 F with consequent freezing of the soil on the rate of heat transfer

c. Determine the effect of pipe spacing on the rate of heat transfer.

Three types of heat pick-up units are being studied in this project; tapered monotube pipings, horizontal extended-surface pipe bundle and vertical pipes.

No specific heat pump package unit is being used. The compressor of the assembly is a 7½ hp two-cylinder reciprocating refrigeration compressor using Freon-12.

Water and antifreeze are circulated

through the various ground coils for heat pick-up.

The project was initiated in April 1947 and it is expected to be completed by June 1948.

University of Washington

The Engineering Experimental Station of the University of Washington is continuing research on the subject: "Earth as a Heat Source." The program, under directorship of G. S. Smith and supervised by recipients of Graduate Fellowships, was started in October, 1946.

The initial phase of the project, an economic and mathematical study comparing resistance heating and the heat pump, has been completed and published.

A main objective of the program is to determine for Western Washington conditions, whether or not it is feasible to use earth within a reasonable distance from the surface, as a source of heat for the heat pump. The project will also include measurements of soil characteristics, such as density, moisture content, pH value, thermal conductivity, specific heat and temperature gradient.

In this project, water and Freon-12 will be used for heat pick-up.

The Department of Geology is also planning to make studies on this subject but no data is available at the present time.

University of Kentucky—Kentucky Utilities Co.

The Kentucky Research Foundation, University of Kentucky, is planning a project sponsored by the Kentucky Utilities Co., which is expected to be in progress by September, 1948.

The main objective of the project is to determine the performance characteristics of a heat pump using the earth as a heat source. It is hoped that it will be possible to install the ground coil in such a manner that data may be obtained to measure the thermal diffusivity of the soil while the heat pump system is in operation.

Professor E. B. Penrod, director of the project, states that in the initial phase of the program water will be circulated through the ground coil. After the theoretical methods and equipment arrangements have been satisfactorily tested, it is planned to substitute an antifreeze for the water and operate the evaporator at lower than freezing temperatures.

The unit to be used for this project is a 3 hp package unit. During the research program the unit will be used to heat and cool the Mechanical Engineering Laboratory.

Wisconsin Electric Power Co.

The Wisconsin Electric Power Co., Milwaukee, Wisconsin, is continuing the heat pump research program initiated in July, 1946. The project, directed by O. O. Wagley and supervised by C. H. Randolph, concerns the earth as a heat source, and heat pick-up units.

The over-all objective of the program is to determine the performance of well casings and of vertical pipes for obtaining heat from the ground. This will include the amount of heat available and the temperature at which it can be obtained.

Various types of vertical coils are being tested in conjunction with a 3 hp package unit. The fluid circulated in the coils for heat pick-up is a 25 per cent alcoholic solution. The entire system is completely metered with accurate recording devices.

Union Electric Co. of Missouri

The Union Electric Co. of Missouri is continuing the project started in November, 1946.

The objective of the program is to determine the practicability of heating a residence by means of the heat pump and to investigate the use of ground coils and the extent to which heat can be extracted from the earth for residential heating. An attempt will also be made to determine the operating cost per heating season and to accumulate year-round data on the flow of heat in the ground toward buried pipe.

The equipment installed is a 5 hp package unit. The unit is connected to the duct work of the residence in parallel with the existing gas furnace so that either can be used.

A non-freezing liquid consisting of ethylene glycol and water is circulated through the ground coils for heat pick-up. The system is completely metered so that accurate operating data may be recorded.

E. A. Freund, planning coordinator of Union Electric Company, is in charge of the research program.

Kansas State College

The Kansas Committee on the Relation of Electricity to Agriculture is sponsoring a research project concerning the possible use of earth as a heat source. The project will begin about May 1 at Kansas State College.

Primary objectives of the program are:

a. To determine under specified conditions the amount of heat energy that may be drawn from, and dissipated into, the earth from standard lengths of pipes buried at different depths

b. To determine the effect of soil moisture upon the heat capacity of the soil.

The fluid used for heat pick-up will be water. The water will be circulated through the ground coils at various temperatures and rates of flow. During the testing phase of the program, thermocouples will record the temperature data. Moisture content of the soil will be measured before and after each test period.

A ¾-hp compressor will be used in this project.

Commonwealth Edison Co.—Utilities Research Commission

A project initiated in 1945 by the Utilities Research Commission, Chicago, Illinois, and sponsored by the Commonwealth Edison Co. and associated companies, will be continued in 1948. The objective of the program is to determine the feasibility of using the heat pump for space heating in the Chicago area. The immediate purpose is to measure the effectiveness of horizontally buried ground coils and a recirculating system in a deep well as heat sources.

No commercial packaged unit is being used in this program. The assembly consists of assorted parts for laboratory use only.

In the test of the ground coils a refrigerant is expanded directly into the buried coils; brine is used in the deep well recirculating system.

Data is being compiled during the progress of the project and will be published upon completion.

Southern Research Institute

The Southeastern Electric Exchange on behalf of some fourteen of its members, has executed a contract with the Southern Research Institute for a continuation of the heat pump research project, which has already been underway for the past two years. The Institute will devote its efforts during the year to the following activities:

1. Investigate heat sources further in an effort to find one which is satisfactory and make a residential test installation when a promising source has been found.
2. Study means of controlling temperature and humidity in heat pump

installations so as to give best comfort conditions.

3. Evaluate actual installations of heat pumps to determine (a) installation costs, (b) operating costs, (c) heat source performance, (d) heat pump unit performance, and (e) occupant's reaction toward the heat pump and its performance.
4. Do further work on a guide for use by participating companies in application problems involved in heat pump installations.

Texas A & M Graduate School

The Texas A & M Graduate School is sponsoring a project conducted by the Research Foundation at the College Station. Work on the project started in February, 1947 and is expected to be completed by the middle of 1948.

The objectives of the project are to obtain data concerning:

a. Heat transfer from soil to water circulated through buried steel pipe
b. Temperature gradients in soil surrounding the pipe, as measured by approximately 100 buried thermo-couples.

Results of this study will be correlated with those of the project sponsored by the Texas Electric Service Company.

The program is being directed by Professor W. E. Long.

Texas Electric Service Co.

The Texas Electric Service Co. is sponsoring a project by the Texas A & M Research Foundation concerning properties of the earth as a heat source.

The program was initiated in March, 1947 and is expected to be completed by the middle of 1948.

The general objective is to determine, for climatic and geological conditions in Texas, the feasibility of using the earth as a heat source for electric heat pumps. This will include:

a. Selection of a recognized soil classification system for identifying types and characteristics
b. Standardization of soil sampling and testing methods
c. Measurement of soil properties such as density, moisture content, thermal conductivity and diffusivity, specific heat, electrical resistivity and pH value
d. Behaviour of ground water and thermal effects produced
e. Natural temperature gradients in earth, including effect of character of earth top surface
f. Cyclic temperature variations caused by natural climatic heat gains and losses
g. Influence on vegetation growth, of heat withdrawal and addition
h. Corrosion characteristics of Texas soils.

Results of this project will be correlated with those of the project sponsored by the Graduate School.

Philadelphia Electric Co.—Chrysler-Airtemp

The Philadelphia Electric Company and the Chrysler Corporation, Airtemp Division, are undertaking a joint cooperative heat pump research project.

The object of the project is to determine the performance characteristics of heat pumps for a year-round job of heating and cooling of residences, by utilizing the earth as a heat source or as a heat sink, and by employing a conventional and an improved cycle of heat pump operation; to investigate the heat transfer characteristics of the earth, and the extent to which heat can be extracted from and dissipated in the earth in connection with a residential heat pump installation.

Two residences located in the territory served by the Philadelphia Electric Company will be equipped with specially-engineered and factory-built, package unit, electrically-driven heat pumps of either five or seven and one-half horse power. The units will be connected to the existing duct work of the residences.

A non-freezing liquid, consisting of ethylene glycol and water will be circulated through the earth coils. Each installation will consist of three loops of earth coils of varying length of two 1½" wrought iron pipes connected in parallel, terminating at a header, and equipped with valves to permit a variety of operating combinations of the loops, if desired.

Both installations will be completely instrumented for the measurement and recording of all essential data pertaining to the earth, the liquid circulated therein, the heat pump unit and its auxiliaries, and the significant conditions in the house.

Present plans are to have these installations operating in July of 1948.

The research work now in progress or which is planned for the immediate future should result in additional data which will be very helpful in evaluating the possibilities of ground as a practical heat source for the heat pump.

However, any study of the heat flow to and from the earth must be a long range program since reasonable cycles must be considered. Consequently, time must elapse before reliable and practical data can be expected from research projects now in progress.

Rubber Glove Practice

(*Continued from page* 84)

replies indicates that in most cases there was some doubt as to whether the damage noted actually was corona cutting. No gloves were reported as seriously injured and none resulted in a glove failure. One company reported that "44 per cent of the gloves which were rejected were for reasons of corona cutting with the remark that it is difficult to distinguish between 'corona cutting' and 'heat cracks'." In general, it appears that corona cutting is not a serious factor in the safe use of rubber gloves as used at the present time.

Where Required to Be Put On

The lineman is required in 53 per cent of the companies to put on his rubber gloves *before* he gets to the working position (while on the ground or *part* way up the pole), 30 per cent when in the working position and 17 per cent optional. The pros and cons of this question could be discussed at great length without arriving at a general agreement. The fact remains, however, that many linemen are seriously and fatally injured because they did not have their rubber gloves on when they should have. If a lineman is required to have his gloves on before he is within reaching or falling distance of energized parts, he is more apt to have them on when they are required for his own protection.

Rubber Sleeves

Most companies apparently are not sold on the use of sleeves. Only 8 per cent always require their use with rubber gloves, 53 per cent have sleeves available and use them at times, and 39 per cent do not use them. Consideration of the pros and cons of rubber sleeves is a controversial subject. However, as a passing remark, attention is called to the fact that a 14-in. glove leaves exposed more of a lineman's arm than it effectively covers. Some companies use extra long gloves instead of sleeves to protect the arms. If rubber sleeves provide the protection which they are intended to provide, it may be an item of rubber protection worthy of reconsideration by many companies to make work safer.

The 16th Convention of the Institute

(*Continued from page* 66)

gin with a presentation of the industry's prize awards by H. M. Sawyer, Chairman of the E.E.I. Prize Awards Committee.

The benefits to be gained by electric utilities through active participation in community development activities will be described by A. C. Spurr, President of the Monongahela Power Company, whose company has pioneered in programs of this type. Mr. Spurr will present several case histories of typical company activities designed to foster community relations.

Dr. H. H. Bennett, Chief of the Soil Conservation Service, U. S. Department of Agriculture, will present "The Utilities' Stake in Conservation," and will show how intelligent conservation of soil and water directly affects the welfare of business and public, as well as that of the farmer. The concluding subject in the morning session is "Leadership in Accident Prevention," to be presented by A. T. O'Neill, President of the Buffalo Niagara Electric Corporation. Mr. O'Neill, who has taken an active part in accident prevention work, will discuss the urgent need for reversing the present upward trend in accident frequency in the industry.

"The Future — A Challenge" is the topic assigned to J. B. Thomas, President, Texas Electric Service Company, who will outline the recent immense progress in engineering and physics, and the need to hasten application of many of these new ideas to our industry. He will also discuss a new philosophy of rate structure and commercial policy.

These authoritative discussions of matters uppermost in the minds of electric utility executives today will round out the comprehensive presentation of the industry's expansion plans, and should make the 1948 E.E.I. Convention one long to be remembered throughout the industry.

Registration

Monday, May 31st, the Convention Registration office will open at 11 a m in the main lobby of the Hotel Traymore. Registration will also be conducted at the Traymore on Tuesday morning, June 1, at 8:30 a m and continue there until noon.

The Registration office will then be moved to the Atlantic City Convention Hall and will remain open until 5:00 p m. On Wednesday and Thursday, June 2 and 3, registration, at the Convention Hall, will open at 9:00 a m and continue until 5 p m.

A registration fee of $10.00 will be charged all registrants at the Convention. *Admittance to All Business Sessions and Social Functions Will Be by Convention Badge Only.* Please register as promptly as possible after checking in at your hotel.

Location of Meetings

The five general sessions of the Convention will be held in the Atlantic City Convention Hall.

Meetings of the three Division General Committees, namely, Accounting, Commercial and Engineering, will be held on Tuesday, June 1, at the Hotel Traymore. Full information on these meetings will appear in the Convention Program to be distributed at the Registration office.

"Convention Daily"

The "Convention Daily," to be published through the courtesy of the *Electrical World,* will report the business sessions, and carry general news, a calendar of events and official notices. It will also carry a list of those who register. It will appear on Tuesday, Wednesday and Thursday.

Recreation—The After Hours

For the after hours:

Tuesday afternoon, 5 p m to 7 p m, Hotel Traymore. Cocktail party. General Electric Company, host.

Wednesday afternoon, 5 p m to 7 p m, Hotel Traymore. Cocktail party. Westinghouse Electric Corporation, host.

Thursday evening, 7 p m until midnight, Hotel Traymore. Informal buffet supper in honor of President and Mrs. Oakes. Special entertainment features will be followed by dancing.

For the Ladies

A visit to the Brighton Nurseries (the famous $1,000,000 orchid farm) and a luncheon at the Seaview Country Club, Absecon, N. J., have been arranged for Thursday, June 3, in compliment to the ladies attending the Convention. Buses will leave the Hotel Traymore at 12 noon for these events. The Nash-Kelvinator Corporation will be host for the luncheon.

Public Utility Motor Vehicle Supervisors Hold Annual Conference

THE Annual Conference of Public Utility Motor Vehicle Supervisors, sponsored jointly by the EEI Transportation Committee and the American Gas Association Motor Vehicle Committee, will be held at the Hotel William Penn, Pittsburgh, April 19, 20, and 21.

The program has been divided into six sessions, five of which will be in the form of symposiums. The opening session will feature Professor Amos Neyhart of Pennsylvania State College who will talk on Driver Selection and Training to be followed by a general discussion and question period. The symposium on Monday afternoon will feature problems connected with automotive cooling systems and anti-freeze with M. C. Alves, Chairman of the AGA Motor Vehicle Committee, presiding.

The Tuesday morning and afternoon symposiums will cover the general subject of maintenance and will feature a discussion of modern maintenance methods led by W. J. Cumming, Manager, Field Service Division of White Motor Co. Mr. Cumming is perhaps the leading maintenance engineer in this country and has had some thirty-five years of experience in this field. The morning session will be presided over by J. R. North, Vice Chairman, EEI Transportation Committee and the afternoon session by Guy P. Jackson, Vice Chairman, AGA Motor Vehicle Committee.

The Wednesday morning symposium will cover vehicle selection and application with the discussion to be led by V. C. Kloepeer of the Ford Motor Co. J. Y. Ray, Chairman, EEI Transportation Committee, will preside. The afternoon symposium will cover problems in connection with operations. Mr. Ray will lead the discussion and F. M. Rudman, Chairman of the Joint Program Committee, will preside.

The program has been arranged so as to confine the discussion at each session to such topics as fall under one general classification. All public utility motor vehicle fleet operators are urged to send suggested subjects for discussion to F. M. Rudman, Michigan Consolidated Gas Co., 415 Clifford St., Detroit 26, Michigan, who is Chairman of the Program Committee, and who will place them in their proper section of the program.

Some Objectives for Public Utility Advertising

By Robert W. Pratt
Public Opinion and Market Research Consultant, Greene, R. I.

A speech presented before the New England Regional Conference of the Public Utilities Advertising Association on February 5, 1948.

WHAT do we really know about public attitude toward the service of electric utilities? In interviewing the public we have found that almost everyone can answer questions about electric company service, and almost everyone does so when asked. More people have opinions concerning the service of electric light companies than have opinions concerning the service of other utility and non-utility businesses, and these opinions are overwhelmingly favorable. Criticism and dissatisfaction with such basic elements of service as maintenance of power service, even voltage, and promptness in attending to meter connect and disconnect orders, have been negligible.

In short, the product, electricity, and the manner in which it is delivered to customers' service outlets, are accepted as very good indeed. This is perhaps the strongest point of electric utility public relations. This is a very important fact advertising-wise, as shall be brought out later.

Fighting Public Indifference

One of the two weakest features of electric utility public relations is public indifference toward the companies. We have good evidence that the vast majority of members of the general public while not hostile or unfriendly toward electric utilities are not especially friendly either. They are just indifferent.

This indifference is a product of the impersonality with which the affairs of an electric utility, especially in the larger places, are, necessarily or not, conducted. A customer's principal contact with the company is the light switch. There is nothing very personal about that.

The District Representative system was devised to provide customers with a single personal contact with which their business with a public utility could be carried on. The inventor of the system had public relations in mind, and it would seem that he was on sound ground.

However, the District Representative system is not very widely used within the industry, and customer contacts with company personnel today are for the most part accidental and casual. There is little or no scientific follow-through in customer contacts of a type that might develop among customers a feeling of being personally acquainted with the company as they may be, for example, with their grocer or filling station operator.

Today, in nearly all companies, the principal source of customer contact with company personnel in a business way is probably with the clerks to whom bills are paid. Other contacts are with meter readers, telephone operators, service men, company salesmen, and home economics and other promotional personnel. These contacts are, for the most part, infrequent and irregular.

There is, of course, the service club and civic activity of company officials in most places, but it is doubtful whether knowledge of and interest in these activities penetrates down to the mass of customers, especially in the larger places.

There remain the social contacts of company personnel in their private lives. Such contacts touch a lot of people, but these are necessarily only a part of the mass of customers.

Frequency of Personal Contact

Observe that we are not considering here the quality of the personal contacts that do occur. This is important, and most management is aware of it, but it is another story. We are considering here only the question of whether personal contacts occur at all on a desirable scale.

We ought to accept the fact that the personal contacts of electric utilities with their customers are, by and large, less regular and less frequent than would be desirable. Coincidentally with this we find an attitude of indifference toward the companies together with some evidence of a relationship between the two elements.

The other of the two weakest points of electric utility public relations is public attitude toward the cost of electricity. By this is meant psychological or emotional attitude. It is not necessarily a rational attitude in the sense that it is factually based, or the result of any conscious thought process.

Public Attitude on Rates

Here are some interesting facts about public attitudes concerning the cost of electricity. These facts are derived from studies conducted from 1943 through the early part of 1947 in fifteen different electric utility operating territories well distributed throughout Massachusetts and Rhode Island.

> There are more people who feel that the cost of electricity is high than there are who feel this way about other cost-of-living items, with the exception of food. Such other items include gas, telephone, water, rent, and taxes. The actual number who consider electricity high is about four out of ten.
>
> In four of the territories those who felt electricity was high were asked what they thought this was due to. More than six out of ten were unable to say.
>
> In four territories, not one single person asked was able to name correctly the domestic rate in effect in his territory. In ten territories, only one-half of those interviewed were aware of the existence of a step-rate. In eight territories awareness of recent rate reductions was tested, and it was found that fewer than one out of ten had any such awareness.
>
> People with high electric bills are more likely to consider the cost of electricity high than are those with low bills despite the fact that they actually pay a lower price per unit of electricity used.

Two things seem clear. First, public attitude concerning the cost of electricity is less favorable than it should be and

deserves to be. Second, people's feelings about the cost of electricity are not the product of conscious thought processes.

Rates Affect Public Attitude

And now to look at a phenomenon which may seem surprising in the light of what has just been said. There does tend to be a relationship between the attitude toward the cost of electricity in a territory and the actual rate in effect there. The following chart will show this relationship:

Attitude	Rate
1	1
2	2
3	3
4	7
5	8
6	9
7	5
8	14
9	10
10	6
11	4
12	13
13	12
14	11
15	15

The left-hand column of figures stands for the fifteen operating territories lined up in order of the favorableness of their attitudes toward the cost of electricity. One stands for the most favorable attitude, and 15 stands for the least favorable attitude.

Attitude toward the cost of electricity was determined by asking exactly the same question in the same way of comparable samples of residents of each territory. The results from the fifteen territories are comparable, and we have a right to make the comparison we have made.

The figures in the right-hand column are an index to the relative highness or lowness of the rate in effect in each territory at the time of the survey. One stands for the lowest rate and 15 stands for the highest rate.

In preparing the right-hand column the rate in effect in the territory at the time of the survey was applied to a monthly use of 70 kwh. The figure 70 kwh was selected as the appropriate basis for comparing rates as a result of examination of the actual average domestic kwh consumption in each territory at the time of the survey.

We see at once a rough correspondence between the two columns of numbers, subject to three prominent exceptions. Using the left-hand column of figures for reference, these exceptions are territories 8, 10, and 11.

Territory number 8 is notable because the attitude toward the cost of electricity is conspicuously better than that which might be expected from the rate. What seems to be the obvious explanation is both highly interesting and significant. On all other points of public relations on which it is possible to make comparisons with the other territories, territory number 8 comes out on top. Thus we have a situation where good public relations in matters unrelated to the cost of electricity evidently produce, or at least are found coincidentally with, a better attitude toward the cost of electricity than might otherwise have been expected. Territories 10 and 11 are ruled out because of factors extraneous to our subject: in both cases a municipal ownership battle.

In all the other territories, there seem to be no influences that might have tended to sway public attitudes particularly one way or the other.

If territories 8, 10 and 11 are eliminated from the list, and the other territories re-numbered, the correspondence between the two columns of figures becomes even closer.

Attitude	Rate
1	1
2	2
3	3
4	5
5	6
6	7
7	4
8	8
9	11
10	10
11	9
12	12

This chart is one of those rather startling things that emerge every so often in public opinion research. A lot more thought could be given to its implications over and beyond its application to the present problem.

Influencing Opinion

Limiting ourselves to consideration of the present problem, it would seem that two very highly significant conclusions are to be drawn from the chart.

First, it seems clear that if public attitude toward the cost of electricity is subjected to approximately the same influences in each of a number of territories having varying rates, it will find a natural level corresponding reasonably well with the actual rates.

Second, the chart strongly suggests that public attitude concerning the cost of electricity can be influenced by factors other than the rate itself, and that it can be influenced favorably as well as unfavorably.

(Note that a change in public attitude, for better or worse, in all of these territories as a result of subjecting them all, uniformly, to the same influences, would not change their relative positions on the chart. The relative positions shown here are the result of aligning a series of absolute measurements of attitude in relative order of favorableness. These absolute measurements are suitable for recording any future changes in attitude which may occur in any or all of the territories.)

If anyone has any doubt about the desirability of having as favorable a public attitude as possible toward the cost of electricity, let him be reminded that municipal ownership agitation invariably exploits the cost of electricity as its principal argument. There are other reasons, but if that were the only one, it would be enough.

And now to relate all this to the problem of utility advertising. What is the importance of these facts to the concept and preparation of electric utility advertising copy?

Three Facts about Public Relations

Let us summarize, for a moment, the ground we have just been over. We have noted three important facts about public relations. First, the product of electric public utilities is accepted as very good indeed. Second, customers of electric public utilities are indifferent toward the companies and this seems to have something to do with the impersonality of their relations with the companies. Third, public attitude concerning the cost of electricity is less favorable than it should be.

It would seem, then, that two major public relations objectives for electric utilities should be to reduce the impersonality of the companies, and to improve public attitude concerning the cost of electricity. In working toward these objectives advertising can play a part.

How can advertising do this most effectively?

Public acceptance of the product gives electric utility advertising something strong and basic to tie to. There seems to be little need to sell the merit of electric service, per se. It sells itself. And general acceptance of the merit of the product provides a basic copy theme to which can

be tied ideas which are presently less well established in the public mind but which it may be equally important to have the public accept. This will be illustrated presently.

Considering the problem of the impersonality of electric utilities, this obviously can be reduced to the ultimate extent only by people, that is, by more and better personal contacts between company personnel and customers. However, advertising, which is conceived with the basic problem of the need for reducing impersonality in mind, can certainly make a contribution.

Reddy Kilowatt was conceived in recognition of this problem, and the concept seems good.

Institutional advertisements dramatizing the human element illustrate the effective coupling of an idea which it is desired to establish ("we are people") to one which the public already accepts ("service is excellent").

Radio on the local level, because it utilizes the human voice, might be more effectively used than it generally has been to cope with the problem of impersonality.

Methods of Influencing Public Attitudes

As to the methods by which public attitude toward the cost of electricity might be improved, a number of ways suggest themselves. Some of these seem to be sound and others unsound.

To look at the unsound first. It seems unsound to try to improve public attitude toward the cost of electricity by talking factually about rates in advertising copy. First, the figures mean nothing by themselves. Customers don't know whether 2¢ or 3¢ or 5¢ per kwh is low, as may be claimed, unless they can make comparison with some kind of yardstick. Second, to spend money and energy establishing a fact which is subject to change after you get it established seems foolish. Third, it invites controversy. Fourth, and possibly most important, you are not dealing with a rational attitude, anyway.

However, there is one kind of factual reference to rates in advertising that seems to be both sound and desirable. This is the use of copy pointing to the historical downward trend of electric rates. This theme should not be disqualified as untimely now, on the ground that some rate increases may be inevitable. As a matter of fact, in view of the upward movement of practically all prices except the price of electricity, such copy may tend to develop a better receptiveness for higher rates, if they come.

It is perhaps fortunate that the attitude you seek to influence is not very rational. That may make it easier to influence. In any event, it is doubtful whether it can be influenced much by a purely reasoned appeal.

What are some approaches that might be successful?

First, there are the slogans. "L.S.M. F.T." Slogans can be made to stick in direct ratio to the amount of reiteration they are given. Is there any reason to believe that the simple idea that electricity is cheap cannot be made to stick in the public mind by reiteration?

Electricity Is Cheap

The phrase, "electricity is cheap," is just about the simplest possible statement of the idea that it is desired to instill. It makes its point without the use of figures, and it is a statement that can be defended, regardless of rates in any locality, in terms of the manifest benefits of electricity. It is a universal slogan.

The phrase, "electricity is cheap," has, of course, been used as part of a slogan designed to promote lighting, but this is not quite the same purpose as that suggested here.

An indirect way of furthering the idea that electricity is cheap, and it seems to be a very important way, is by means of copy which has the effect of reminding people of the value received for an electric dollar. We have already noted that the attitude concerning the cost of electricity deteriorates as the size of the bill increases.

The situation with which advertising must cope is illustrated by the following. A customer buys an electric refrigerator. He expects his bill to go up. If he has been well sold, he has been told about how much this increase will be and he is not surprised or resentful when his first bills come in. He is still mindful of the mess and inconvenience and spoiled food incidental to his old ice box. But gradually he loses sight of the old inconveniences. He takes the new for granted. He is progressively less conscious of the new. But the bills keep coming, and the bills stay up.

That customer must not lose his faith in the wisdom of his choice. "Cheap" electricity can be sold to him with his bills, by constant reminders of the value an electric dollar buys.

Some companies have considered use of the phrase, "electricity is cheap," but have rejected it on the ground that the word "cheap" may carry unfavorable connotations. Yet no one has ever claimed to possess any evidence that it *is* a dangerous word.

The "Webster's Dictionary" definition of "cheap" is as follows:

As a noun

1. A bargain or bargaining
2. A market place (obsolete)

As an adjective

1. Of small cost or price
2. Of comparatively small value; of slight esteem

"Allen's Synonyms and Antonyms" gives the following synonyms for "cheap": inexpensive, economical, low-priced, vulgar, meretricious, base, paltry, gaudy and, as specific and/or colloquial uses, easy, popular.

There will be little disagreement that the above catalogue of meanings and connotations is complete. In considering these meanings and connotations, it seems that the only meanings or connotations that are possible where "cheap" is used as an adjective to modify "electricity" are "a bargain," "of small cost or price," "inexpensive," "economical," "low-priced." This is because of the inherent nature of a kwh. You can say a person's or a company's character is "cheap," and this is deprecatory. You can refer to an article or merchandise as "cheap," and the reference may carry connotations of inferior quality. But there is simply no such thing as a kwh that is of comparatively small value compared to another kwh. Nor are there kwh that can be held in low esteem by anyone compared to other kwh. Nor are there any vulgar, meretricious, base, paltry, or gaudy kwh. It simply does not seem possible to imply inferior quality in a kwh, or to undignify it by calling it "cheap."

There remains the thought that the word "cheap," though used to modify "electricity" may be transferred in the public mind to modify the electric company using the phrase. For such a thing to occur would require that the word "cheap" be lifted from a phrase where it can have only one meaning (a favorable one), mentally shifted to modify something that does not appear in the phrase, and then endowed with a change of meaning. It seems that the number of people who will engage in any such mental triple play is probably small enough to forget about.

(*Continued on page* 92)

Clifford J. Strike

CLIFFORD J. STRIKE, 52, president and chairman of the board of directors of the Idaho Power Company and a member of the Board of Directors of the Edison Electric Institute, died at Boise, Idaho, on February 11. He had been confined to his home since last October.

Mr. Strike was named president, general manager and chairman of the board of the Idaho Power Company on June 11, 1938, relinquishing the general managership last June to T. E. Roach, executive vice-president.

Mr. Strike started in the electric utility business as a lineman in South Dakota in 1915, and in 1921 organized and was president of the Consumers Electric Service Company of Webster, S. D. When the Consumers firm was incorporated into the Northwest Public Service Company at Huron, S. D., in 1924, he became vice-president and general manager of the organization after serving as sales manager. In 1937, he was named president of the company and three affiliated firms.

He brought to Idaho a keen understanding of agriculture, industry and national affairs which soon marked him as a leader in community and state development. He was a speaker on almost innumerable occasions before meetings in all parts of the state, as well as in neighboring states. At these times he presented a clear cut analysis of state and national affairs, and appealed for greater understanding of economic problems to the end that business, agriculture and labor would solve mutual problems and prevent recurring depressions. Believing that national economic problems are merely the sum total of local problems, he urged each community to assume its responsibilities and not to expect a benevolent government to indefinitely underwrite the program of general welfare.

MR. STRIKE

Mr. Strike gave leadership to programs of research and development in Idaho and eastern Oregon continuously during the past ten years. It was he who introduced farm chemurgy into the area in an organized fashion, and Idaho Power Company was active in this field of agricultural and industrial research and development. He believed that the electric company, in addition to conducting its day-to-day business, has a responsibility to work for community and state welfare.

He kept a program of electric system expansion moving ahead of the needs of Idaho Power customers, and made possible a fair return to company stockholders as a basis of securing new funds for further investment.

Under his leadership, Idaho Power Company became an independent utility in 1943, when its common stock was sold to the public, and he was engaged during the past three years in a major expansion program for the Company.

Mr. Strike, a former president of the North Central Electric Association, was elected president of the Northwest Electric Light and Power Association for the year 1940-1941. Since June 6, 1947, he had been on the board of directors of the Edison Electric Institute.

A Statement of Policy

WE ARE a business enterprise—dependent for success on the high quality and fair price of our service; on the skill, courtesy and loyalty of our employees; on the confidence of our investors; and on the ability of our management to forecast and provide for the steadily increasing electric power requirements of our area.

In the conduct of our business it is our policy to render service of the highest quality to our customers—promptly, courteously and efficiently—at prices consistent with a policy of paying fair wages and affording job satisfaction and security to our employees; providing modern facilities for our customers' expanding needs for electric service; and paying a fair return to our investors who have provided the funds to make such service possible.

As a private enterprise entrusted with an essential public service, we recognize our civic responsibility in the communities we serve. We shall strive to advance the growth and welfare of these communities and shall participate in civic activities which fulfill that goal . . . for we believe this is both good citizenship and good business.

These principles, clearly affirmed and honestly carried out, will merit the confidence and good-will of customer and community, employee and investor.

From the 1947 *Annual Report of Union Electric Company of Missouri*

Some Objectives for Public Utility Advertising

(*Continued from page* 91)

But why go on guessing? No one can be more aware of the tyranny of words than one who engages in public opinion research.

There seems to be little disagreement about the desirability of instilling in the public mind the idea expressed by the phrase, "electricity is cheap," provided the word "cheap" carries only the low-priced connotation. Why should the giant utility industry continue to engage in an endless long-hair argument with itself about semantics when the issue is one which can be resolved by fairly elementary research?

It is possible to discover how the public would interpret the phrase, "electricity is cheap." Who will step forward and resolve the issue by sponsoring an investigation as a matter of self-service, and as a service to the industry?

Safety Considerations in Substation And Power Station Design

By W. T. Rogers
Ebasco Services, Incorporated

A speech presented before the Electrical Equipment Committee, E.E.I. at a meeting in Cincinnati, Ohio, on February 13, 1948.

A SIX-YEAR record of fatalities (1941 to 1946) in the electric power industry shows 134 lives lost due to electric shock or burn while working in generating and substations. This amounts to approximately 30 per cent of all shock and burn fatalities in the electric light and power industry during that period.

The statistics just quoted were human lives—134 lives which represent only a fraction of the total accidents which occurred in stations. There were many permanent total and permanent partial disabilities (loss of hands, arms, legs, eyesight, etc.) as well as several thousand lost-time accidents during this period.

Accidents Defined

An accident is defined as a befalling, a mishap, an event that takes place without one's foresight or expectation, etc. This definition makes our ordinary use of the word wrong because accidents, as we record them, are injuries caused either by an *unsafe act* or an *unsafe condition* —no mishap involved; either the man did something wrong, possibly without thinking, or an unsafe condition existed.

Overall statistics show that 80-90 per cent of all so-called "accidents" are attributable to unsafe acts. The remainder are attributable to unsafe conditions. There are not only accident-prone employees, there are accident-prone conditions.

However, when you analyze this further, with the exception of a minor number of "Acts of God," they are *all* attributable to unsafe acts—either of commission or omission. It may not have been an unsafe act on the part of the injured but on someone else's part.

The *unsafe act* may have been originated in the mind of the engineer or on the drawing board of the designer or in the failure of the operating executives to foresee the possibility of hazards or to provide adequate maintenance, and in many other ways.

Could not many of the unsafe acts on the part of the workman be eliminated by making things as fool-proof as possible—make it virtually impossible for a man to get into trouble—even making it extremely difficult for him to commit suicide if he should be of a mind to do this? Following this line of thinking, the ideal substation would be one where a man could walk blindfolded through it and not be hurt.

Safety in Design

Great progress has been made over the years in improved design and the men responsible for design have taken safety increasingly into consideration, not only in the layout of the stations but in the design of the electrical equipment itself —the metal-clad gear as a case in point.

Many of the accidents that have occurred in the past, and are now occurring, are attributable to work on old construction. One difficulty in the past has been that many of the design engineers had very little operating experience and safety training. It was difficult for them to visualize themselves in the position of the man who has to operate and maintain the electrical equipment under normal, and especially *abnormal,* conditions.

Engineers without this experience may not perceive that a man will do first the thing which comes easiest or most natural to him. A man, in falling or confronted with an extraordinary situation, may well get into "hot stuff" unless it is out of his reach. That is why the problem of vertical and horizontal clearances is so important.

Designers should be trained to picture the positions men will have to assume in doing maintenance work on electrical installations. They should see that adequate clearance is provided so that men working on de-energized equipment will not become involved in nearby energized circuits.

Engineers and designers should demand sufficient ground area to adequately take care of the equipment to be installed without crowding and have space available for future alterations or additions. There have been too many cases in the past where the designer, instead of insisting upon the amount of space he needed, tried to squeeze equipment into much less than the necessary space. In his understandable pride to do a neat piece of designing he evidently gave little thought to operation, and maintenance, and the renewals, and replacement that must be made. Did he give sufficient consideration to the lives or safety of the men who must care for the stations? Designers must realize that where equipment is jammed together, the accident hazards are tremendously increased.

In our own company, safety is given prime consideration and an attempt is made to keep the layout as simple as possible, either by providing plenty of space or, where pinched for space, by use of cubicle or enclosed construction. On high tension substations the low open type of structure is generally recommended to facilitate safe replacement of insulation and to avoid multiple levels of energized bus work.

Unless there are compelling reasons for not doing so, all stations should be designed in units, cells, compartments, or bus sections sufficiently spaced that arcs, explosions, or failures in one unit will not jeopardize workmen in another unit. Units should be arranged so that one such unit can be de-energized for maintenance and inspection without the hazard of energized equipment.

In one case, a rotary converter transformer and a test transformer were connected to the same oil switch. A tester called for test current, the oil switch was closed energizing the primary winding of the rotary transformer. A workman

stepped into the rotary transformer to clean it and was burned to death. A fire ensued and a helper was overcome by carbon tetrachloride fumes when he attempted to rescue the victim while the fire fighting was in progress. The knife switches had not been opened, which was an operating fault, but nevertheless, the case illustrates the danger of having two circuits on the same oil switch.

This principle of separation and isolation of equipment is set forth in the October, 1947, E.E.I. BULLETIN in an article by H. K. Sels entitled "The Prevention and Extinguishment of Insulating Oil Fires in Power Stations and Substations" — "Proper physical separation and isolation of equipment is of primary importance. In all such cases, all oil-filled equipment should be so located as not to endanger the total installation, which might result in excessive interruption to service. Such group segregation may contemplate arrangements ranging from a standard vault enclosure where justified by conditions of hazard and value, to curbs, pits or trenches, perhaps in conjunction with barriers, of capacity dependent upon the oil content of the equipment segregated and the discharge rate of any drains provided." There is no need here to quote further from that article but we heartily endorse the measures suggested from a safety as well as fire prevention viewpoint.

Failure of Equipment

It must be borne in mind that failure of equipment is an ever present hazard. Here is a case in point taken from the record:

> "Changing insulators on an air break switch. Line had been opened. Man climbed into supposedly dead switch. An air break switch five miles from scene of accident failed to function properly when it was opened. The arcing horns had locked."

Testing and grounding lines before working on them will serve as a "back-up" precaution against some types of equipment failure, but careful study of each case of failure of equipment will lead to improvement in design and fewer failures.

All energized wire, buses, fuses, and disconnecting switches should be mounted high enough to prevent accidental contact from the ground. Where disconnects, air break switches, or other equipment are mounted 15 ft or more above the ground, suitable provisions in the form of walkways or ladder rests should be provided as a safeguard for the men during inspection and maintenance. Permanent barriers should be installed in those cases where sufficient clearances cannot be obtained between energized parts that men work upon. Where fuses are mounted high on a structure, facilities should be provided for the safe changing of such fuses rather than have a man stand on a transformer or other equipment from which he could fall.

Guards and Barriers

Designers have never really completed a job until they have made sure that all practicable guards or barriers have been provided where needed.

Here is a case illustrating this point:

> "While raking leaves inside the lightning arrester enclosure, employee evidently came in contact with the lightning arrester. He died from severe burns."
>
> *Preventive measures reported were:*
>
> "All enclosures have been checked to prevent entry to unauthorized persons. In addition, warning and danger signs have been posted near 'live' apparatus."

This employee had been instructed not to enter the enclosure, but actually unscrewed a wing nut on the gate to enter the enclosure.

That man had no business unscrewing the nut, but the point is—it was too easy. Make it tough for people to enter such places. Human nature is unpredictable and people will do the "darndest" things!

Very severe accidents have been caused by workmen applying grounds to energized parts after having checked for voltage at some point remote from the equipment to be worked upon. This type of accident could be avoided by establishing points and providing adequate facilities for voltage checks and grounding of the equipment.

Another factor of importance is the adequate grounding of metal parts which do not normally carry current.

Cell structures, cubicles, and compartment doors should be interlocked to make access to energized equipment impossible. Such items of equipment as fuses, pot and current transformers, and disconnecting switches should not be in the same compartment with oil circuit breakers unless they are cleared when the breaker is cleared.

If all such items must be in the same cell and cannot be cleared, they must, of course, be completely covered to prevent accidental contact when repair or maintenance work is being done.

Low voltage hazards in stations require particular study. There are many locations where work is done by men in close contact with grounded surfaces and where they use portable tools. Metal frames of such tools should be effectively grounded. Careful consideration should be given to the installation of lower than normal lighting voltage circuits for such locations. Where practicable, avoid or keep to a minimum circuits of varying voltage on control wiring, particularly on gauge boards.

Safety is a never ending job and after the design and construction are completed consideration must be given to other very important matters — a thorough inspection system, preventative maintenance, and fool-proof hold-off systems and rope-off methods for doing work on the equipment. Preventative maintenance is very important. This can be taken care of by a thoroughly organized inspection system.

The tremendous importance of good hold-off practices and absolute adherence to them by every man who works in stations cannot be emphasized too strongly. That would save more lives than any other single factor. The highlights of safe practices are given in a card, shown on page 302 of the August 1947 E.E.I. BULLETIN.

Hold-Off Systems

Of course, a hold-off system is only as good as adherence to it.

At times when electricians are looking for electrical faults they are tempted to circumvent hold-off systems or blocking systems. One company that has a testing procedure incorporated in their hold-off system had a rather serious accident about a year ago due to the earnest desire of the individual to locate the trouble quickly. In doing so, he broke several rules and received severe burns. Therefore, it is of extreme importance not only to have routine procedures in testing and checking but to see that they are carried out.

The same applies to practice with regard to roping-off and blocking-out both indoor and outdoor equipment when work is to be done. It is surprising how often the actual practice varies from instructions.

Good design will necessarily simplify the rope-off problem.

The number of safety considerations in the electrical design of power generating and substations to prevent electrical injuries alone comprise a long list. However, here are briefly some of those con-

siderations which should be particularly stressed:

1. Try to arrange equipment so that when deenergized all such equipment on that floor, or in the section is dead—so there will be no exposure to live equipment or leads while working on dead work.
2. Such matters as phase isolation, circuit segregation and spacious equipment arrangement are, of course, definite safety measures.
3. Arrange equipment and layout so that live equipment is located where non-operating personnel do not have to go. Also, insofar as possible have potentially dangerous areas isolated. Keep these areas out of the operating area.
4. Try to have everything in the station in the same location so that operating procedure can be repetitious. Don't have A phase where C phase might be expected to be.
5. Arrange for proper identification of all parts of a circuit.
6. Have ample warning signs and legible markings plainly in view. Also have markings so that when doors are removed additional markings will be visible. Eliminate the guess work.
7. Provide ample aisle widths.
8. Never have a dead end or blind alley —always have an exit in the event an employee is trapped and finds his way back to the entrance blocked. See that doors open outward for quick escape.
9. Provide sufficient and properly marked emergency exits.
10. Try to visualize movements of operators or persons who have to walk by live equipment.
11. Try to visualize positions of operators, maintenance men and inspectors. Provide sufficient working area and clearance for such personnel. For example, if a man has to use a switch stick, be sure that when he holds it in position he will not have to back into or near any live equipment.

Other more specific suggestions would include:

1. Adequate spacing of circuits—isolating disconnects.
2. Elimination of overhead bus sectionalizing disconnects which open downward.
3. On other disconnect installations never have live blade hanging down.
4. Eliminate "trick taps" or T taps insofar as possible.
5. Have fool-proof, "spelled-out" system for rope-off, testing, and watching during repair work.

In general, watch out for tripping hazards, obstructions, floor openings, etc., and provide adequate stairways with railings, railings and toe boards where required, platforms and ladders for easy access to valves, instruments, bearings, etc., provide suitable guards around rotating or dangerous equipment and provide good illumination and ample clearance. In other words, try to visualize the jobs of the operators, inspectors, maintenance personnel and cleaners and remove or guard against all hazards.

Because neglect of these matters is the cause of many injuries and deaths, the more hazards that can be eliminated in the original design, the safer will be the operation of the property.

Economic Design and Safety

A station design which, on the face of it, may save money, space, equipment, and materials may be more costly in the long run because of:—

a. Outages caused by fire or failure of adjacent equipment.
b. Higher maintenance costs, because of necessity for elaborate, time-consuming barricading, clocking out, etc., and slower work because of cramped conditions.
c. Direct and indirect cost of employee injuries.

Long-Range Safety Precautions

The safety committee of the American Institute of Electrical Engineers, and the American Society of Safety Engineers have been working to stimulate interest in safety in our engineering colleges—working through student branches and working with faculties to get safety woven into the electrical engineering courses and also to set up regular safety courses. It is urged that everyone back up this effort so that engineers will have safety definitely in mind when they graduate from college.

Those companies that have training courses for engineers and even those companies who do not have such courses should make some provision for these men to spend some time in the operating and maintenance department before taking up the regular work in station engineering and design.

Designers and engineers should spend some time in the field actually visiting the stations and talk with the people who have to operate and maintain them, to get their ideas and learn at firsthand the problems with which they are confronted. In this way, they will undoubtedly receive many suggestions for the elimination of hazards in future work.

It would be well if engineers and designers could sit in on investigations of major accidents which occurred in the power department and also attend safety meetings where accidents are discussed. At these meetings a review could be made of all serious station accidents with a view to seeing whether improper or faulty design may not have been the basic cause of these accidents and to discuss ways and means of eliminating hazards.

It may be advisable to review the economic aspects of design, giving more weight to the cost of human life, prolonged illness, compensation, etc., the cost of making changes after the station is built, the cost of outages caused by accidents and the cost of fire both from the standpoint of damage to personnel, equipment and service.

Although fully aware of the accidents caused by unsafe acts of workmen—failure to follow instructions, failure due to operating procedure, inadequate maintenance, laziness, psychological and physical factors, supervisory failures and a host of other causes; the emphasis in this talk has been mainly on the safety considerations for designers and engineers.

Accident prevention has taken great strides since the early days—when the method of handling it was to appoint some older employee who was ready to retire anyway and make him responsible to see that the boys didn't get hurt. Today, progressive managements realize that it is not necessary for workmen to be hurt and that safety is everybody's job.

The Safety Man

The safety man is a staff man whose job it is to record, analyze, spot the trouble, consult with, and advise the line organization and to keep safety considerations before the management supervisors, and the men. But the actual practice of safety is the responsibility of *all* — the foreman, the superintendent, the workman himself and the engineer, designer and operator. Perhaps the engineer has the best opportunity of all to prevent accidents and the greatest responsibility. For after all, they start with a clean sheet of paper — whereas the operators, foremen and workmen — have to take their conditions as they find them.

Alexander Maxwell

ALEXANDER MAXWELL, former Director of Engineering of the Edison Electric Institute, who retired from that post June 30, 1946, died Feb. 10 at the Norwalk Hospital, Norwalk, Connecticut, after more than fifty years' association with the electric utility industry. He was 69 years old.

A nationally recognized authority on the subject of standardization and the formulation of codes affecting power supply and distribution, Mr. Maxwell was born in New York City in 1878. After a brief connection with the Westinghouse Electric and Manufacturing Company he joined the Manhattan Electric Company in 1895 as assistant to the electrical engineer.

Except for military service during World War I in which he served as a lieutenant of engineers and later as a major of the 7th Field Artillery, 1st Division, AEF, in France and Germany, he remained with that company and the New York Edison Company, its successor, until 1923. For nearly two decades after the first World War he was active as a colonel in the Field Artillery Reserves.

He was a Fellow of the American Institute of Electrical Engineers, and Chairman of its Board of Examiners. He was also a member of the Standards Council of the American Standards, of its Committee on Scope and its Electrical Standards Committee.

The charter of the latter committee is considered a model of its kind; Mr. Maxwell was a member of the group who originally formulated it.

Mr. Maxwell served as engineer on the staff of the National Electric Light Association from 1923, and upon formation of the Edison Electric Institute he became its Director of Engineering until his retirement. "Alex," as he was affectionately called by those who were privileged to associate closely with him, served our industry well over those early critical years, when individual company pioneering progress was expanded to include the more general interchange of practices and ideas, and when collaboration, leading to standard practices in the power, communication and transportation fields was becoming of such vital importance. Of equal significance was his participation in the creation and development of standards of engineering and operation from which stemmed important advances in equipment design and operating methods—important not only because of resultant operating economies, but also because of parallel advances in the protection of the lives and property of both employees and the public.

"Alex," with his broad background, his appreciation of sound fundamentals, his good judgment and ability to envision

MR. MAXWELL

trends, and his understanding and appreciation of the experience and opinions of others both within and outside our industry, naturally enjoyed the full confidence of all those active in this great work. As a result, quietly but effectively, he in this way, as our representative, played no small part in forming the foundations upon which further progress shall safely be based, forgetting himself in his untiring efforts to achieve the most practicable and reasonable advance for all interests.

The high value which those who knew him placed upon his abilities, their recognition of his rare personal and professional qualities and deep appreciation of his friendship, was perhaps most clearly evidenced at the time of his retirement from activity in the Edison Electric Institute. Literally hundreds of men and women, executives, administrators, engineers, scientists, and others active in all phases of industry in this country and abroad, joined in sending letters of appreciation and good wishes to their esteemed friend and associate. It was tragic that ill health should so shortly thereafter have caused his passing.

He was a great and gifted man, guiding a great and growing industry during a critical period. But while doing this he was not unmindful of the future, of those to whom he must eventually pass the torch. And thus today, those who have been most closely associated with him, and inspired by his example, are carrying the torch he has passed on to them.

—WALTER WAGNER

Maryland Utilities Association Annual Meeting

THE annual meeting of the Maryland Utilities Association was held in Baltimore on April 2. Registration showed over 450 representatives from gas, electric, telephone and transportation companies and allied manufacturers operating in the State of Maryland.

The conference consisted of an afternoon session beginning at 2:00 P. M., addressed by:

R. C. Simpson, manager, industrial relations, Gilbert Associates, Inc., who gave a timely discussion of the effect of employee relations on public relations.

N. E. Funk, executive vice-president, Philadelphia Electric Company, who spoke of the threat to utility earnings created by the rising price of fuel, labor and materials as applied both to operation and construction costs.

Fergus J. McDiarmid, vice-president, Lincoln National Life Insurance Co., who made a penetrating analysis of probably the most important financial problem facing the utilities today—raising money for plant expansion.

Following the Fellowship Hour, the meeting continued with an evening dinner which was addressed by the Hon. William Preston Lane, Jr., Governor of Maryland.

The following officers were elected for the coming year:

President: Adrian Hughes, assistant to the president, Baltimore Transit Co., Baltimore, Md.

Vice-President: R. Roy Dunn, vice-president and treasurer, Potomac Electric Power Co., Washington, D. C.

Treasurer: J. Carl Fisher, manager, general service, Consolidated Gas Electric Light & Power Co., Baltimore, Md.

Secretary: Raymond C. Brehaut, manager of suburban companies, affiliated with Washington Gas Light Co., Washington, D. C.

Transmission and Distribution Committee Meeting

T. J. Brosnan, *Chairman*

THE forty-fifth meeting of the Transmission and Distribution Committee was held on February 9 and 10 at the New Hotel Jefferson in St. Louis, with 178 members and guests in attendance.

The Overhead Group, sponsored by H. E. Stites, covered a variety of subjects of current interest.

H. F. Ostman described construction and protection features of 7.2/12.5-kv multigrounded neutral circuits now being built for rural distribution service by the Union Electric Company of Missouri. Vertical configuration for single phase with an 8-ft crossarm added for three-phase has been adopted. A 59-in. vertical spacing and wooden crossarm braces are used to maintain the highest impulse level considered economically justifiable. Automatic oil reclosers and sectionalizers provide the desired degree of sectionalizing while permitting adequate coordination.

Operating experience with all aluminum cable was reported by A. K. Hillemeier. Twelve miles of 13.2 and 33-kv lines operating since 1916 near chemical and industrial plants in the East St. Louis area have caused considerable difficulty due to corrosion at splices and it has not been practical to install compression joints on these lines. Conversely, 54 miles of double circuit line operating for 35 years in a corrosion-free district in Iowa have an excellent service record. These lines are tied with No. 2 solid aluminum tie wires without tape or other protective armor. Conclusions are that all aluminum cable can be used satisfactorily in favorable locations. Recently, No. 4 solid aluminum neoprene coated wire has been used for services but adequate service records are not yet available.

E. W. Oesterreich showed movies of the use of an aluminum extension ladder designed particularly for use in stringing or maintaining transmission lines on steel towers.

Plans for analyzing the causes and possible remedies for galloping conductors were described by M. S. Oldacre and he showed movies of several severe occurrences of this troublesome phenomenon.

F. A. Ashbaugh presented a progress report covering extensive experience with the use of 2,4-D compounds in chemical control of rights-of-way. Ester compounds of 2,4-D have proven most effective and an ester of 2, 4, 5-T has been effective in controlling briars and other woody plants not affected by the 2,4-D esters. High-volume sprays of 100 to 125 gallons per acre applied as soon as the plants are in full leaf are recommended. Orchard-type sprayers carried on four-wheel drive trucks have proven satisfactory. Application costs are about $25 per acre but experience indicates that only four applications in ten years are required, making the annual cost $10 per acre. Minor work required in years when spraying is not scheduled should not bring the total annual cost of maintenance above $15 per acre.

F. S. Spon of the Pacific Coast Borax Company described the use of Borascu for control of growth in rights-of-way. He emphasized the uses that have been made of Borascu in and around pole yards, storage yards, pole or tower bases, substations and along fences where complete soil sterilization is desired to eliminate fire hazards or to improve appearance. This material is applied dry after cutting the area and can be spread by hand or with fertilizer or lime spreaders.

F. E. Sanford of the Copper Wire Engineering Association presented a preliminary report of an investigation in progress concerning the development of requirements for mechanical connectors for copper conductors on overhead lines. This investigation indicates that connectors should meet a performance type specification based on resistance requirements. For use with stranded conductors connector effectiveness can be defined in terms of connection resistance of individual strand wires. Mechanical stability and preservation of contact areas are also important. Cleaning connection surfaces of conductors in exposed service should be adopted as a regular practice. There is a need for a chemical cleaning compound to replace the acid or scraping treatment. An oxidation inhibitor or sealing treatment is also desirable but should not be considered a substitute for pressure contacts.

The Underground Group sponsored by J. A. Pulsford featured a general discussion of problems associated with network overloads. J. E. McCormack, P. B. Boyd, W. C. Phillips and W. McLean described experience with voltage reduction. L. L. Newman, E. L. Leinbach, P. B. Boyd and A. Bodicky described the use of forced ventilation and water sprays for cooling transformers in manholes. J. E. McCormack pointed out that although forced ventilation and water sprays are useful expedients they should not be considered for permanent installation.

E. F. Nuezel summarized the 1946 Cable Operations Report now under preparation. The cable trouble rate was 7.3 per 100 cable miles in 1946 as compared with 6.8 in 1945 while the joint trouble rate was 1.1 per 1,000 joints as compared with 1.5 in 1945 and equals the all time low in 1944 which was also 1.1.

Activities of the Correlating Committee on Cathodic Protection were described by M. W. Ghen. In order to acquaint managements of companies operating sub-surface structures with the fact that individual cathodic protection installations often create problems that can be equitably solved only by joint study and action, this committee has completed a bulletin of general information on cathodic protection which will be issued in the near future.

Organization of the EEI-NEMA Joint Subcommittee on Standards for Underground Transformers was announced by M. W. Ghen.

Recent developments in dry type transformers for submersible service were described by W. W. Satterlee of the Westinghouse Electric Corporation. Mr. Satterlee's complete report is reproduced elsewhere in this issue of the BULLETIN.

A feature of the meeting of the General Engineering Group sponsored by L. G. Smith was a series of reports from representatives of six companies on damage along the eastern seaboard resulting from the New Year's Day sleet storm which produced up to one inch of radial ice with icicles added. As usual, there was little inherent line trouble but falling branches and trees caused extensive damage. All attested to the value of mobile radio service in coordinating repairs and speeding restoration of service. It was estimated that the radio service reduced outage time by one-half. Three companies reported excellent performance of a limited amount of aerial cable which remained in service even though limbs and trees fell over it.

In a report of the Utilization Subcommittee, J. W. Anderson called attention to a trend toward increasing use of domestic air-conditioners with motors up to ¾ hp. Heat pump motors will place still greater demands on domestic distribution systems.

M. H. Pratt outlined plans for a joint AIEE-EEI survey of outages from all

causes on transmission lines 110 kv and above.

C. J. Beller reported progress of a proposed Joint AIEE-EEI survey to determine relative operating characteristics and resulting degree of service continuity of various primary distribution construction and protection methods. Overhead circuits of 5 kv or less are to be studied.

Effects of the 1940 magnetic storm were recalled by J. E. McCormack and B. H. Clingerman distributed standard forms for reporting future experience with this phenomenon in order that the data accumulated may be studied at some later date.

H. P. Seelye reported completion of the joint EEI-NEMA report on preferred voltage ratings covering the entire range of voltages from 120 to 230,000. The report soon will be sent to both the Electrical Equipment and Transmission and Distribution Committees for letter ballot.

J. E. McCormack reported the status of mobile radio for power utilities. Organization of regional groups to coordinate utility service frequency assignments for specific geographical areas has been completed. The FCC now requires applicants for permits to file a statement regarding the appropriate regional group's recommendation concerning the proposed frequency assignment. The FCC has not yet announced decision on the hearing held last November on proposed reassignment of television channel No. 1 (44-50 mc) to the mobile services.

During a symposium on the training of engineering graduates, L. G. Smith, G. E. Dean, G. S. Van Antwerp, W. C. Phillips and W. E. Losie each described training courses of their respective companies. These courses average about two years in length and are designed primarily to train above average men for future executive positions. Most of the courses cover all phases of utility operation and stress observation with a minimum of productive work. The need for reviving undergraduate student interest in the utility industry was emphasized. The current lapse of interest was ascribed to the glamour of electronics and megacycles as compared with the science of power systems whose problems are assumed to have been solved. This indicates a need for wider advertisement in the colleges and universities of the many fascinating unsolved problems in the power field.

A general progress report of the Standards and Specifications Group was presented by its sponsor, F. W. Nimmer.

Comments regarding the current draft of specifications for wet process porcelain insulators have resulted in a decision to prepare separate specifications for the various types of insulators such as high-voltage pin, low-voltage pin and suspension.

A draft of a revised specification for Douglas Fir Crossarms has been distributed to members for comment and a new specification for southern yellow pine crossarms is under preparation.

Favorable response to the letter ballot on the proposed EEI-NEMA specifications for street lighting equipment has been received and six of the standards will soon be ready for issue.

Replies to a questionnaire on distribution fuse standardization indicate a definite need for standardization, a requirement for both a fast and slow series of fuses, a reduced number of ratings in each series to permit better coordination, interchangeability of tin and silver or copper links and a desire for the establishment of definite standard characteristic curves rather than the mere designation of the 0.1-second and 300-second melting points.

L. G. Smith reported that the final draft of the new ASA wood-pole specification has received a favorable ballot by members of the ASA sectional committee. This new specification combines existing permanent and war standards in a single permanent standard.

A. E. Silver reported favorable response to the letter ballot on the Fourth Report of the EEI-NEMA Joint Committee on Standards for Distribution Transformers. Comments have resulted in some changes in voltage taps. The report is now being edited for publication in the near future.

Southern California Edison Completes Radio Communications Network

A complete radio communications system adapted to utility use is now a reality for the Southern California Edison Company, which has pioneered system radio communication since the end of World War I. Beginning in 1937, interrupted only by the six war years, the company has developed plans toward complete radio coverage of the entire Edison territory.

This continuous studying and planning by the company has now resulted in the establishment of a radio system operating on an exclusive frequency of 158.13 megacycles, frequency modulation (FM). This frequency is common throughout Edison territory, except at State Street, Fruitland and La Fresa substations which transmit and receive at 158.25 megacycles, FM. One station in Alhambra, which is a unit of the emergency disaster program and ties in with the sheriffs of seven counties, operates at 2726 kilocycles. The mobile units of which there will be 243 by the end of 1948, operate three-way—car to station, car to car, and station to car.

Because the Edison power system is set up on a unit dispatching basis—the individual units taking over operation in case of emergencies—it was logical that the radio system should be a part of each unit dispatching center. Therefore, the radio stations are as near as possible to the switching centers. At present there are 16 stations, 11 with an output of 250 watts, and five with a 30 watt output. Steel towers 110 feet in height were constructed for antenna at most of the stations, although some of the smaller stations have wood pole supported antennas.

In addition, there are eight fixed repeater stations. All equipment operating on 158.13 megacycles will operate over long distances and irregular terrain through these repeater stations, located at high altitudes, such as the station on Santiago Peak in Orange County.

Eventually "handie-talkie" sets, which are used at the present time on certain construction projects, will operate on the common system frequency and will be invaluable in case of fire, flood and power line breaks, in the event all regular means of communication fail.

One of the most interesting features of this program is the cooperation that exists between the Edison Company, and the city, county, state and federal agencies which are also interested in radio communication. For example, five agencies will use the repeater station on Santiago Peak, including the Edison Company, the California Highway Patrol, the State Forestry Service, San Diego Sheriff's Department and the Orange County Radio Department. Each agency operates on its own frequency and has its own equipment.

PERSONALS

T. E. ROACH, executive vice president and general manager of the Idaho Power Company, Boise, has been elected chairman of the board and president of that utility, succeeding the late C. J. Strike.

Before going to the Idaho properties last year, Mr. Roach was connected with the Northwestern Electric Company, Portland, Ore., as vice president and general manager. He had previously been identified with the Pacific Power and Light Company, first as assistant to the president, with offices in Yakima, Wash., where he supervised and coördinated the operations of the Washington districts of the company. In 1942 he was transferred to the Portland office of the company to assume broader responsibilities connected with wartime system operations. Mr. Roach had been operating head of the Washington Gas and Electric Company from 1932 until joining PP&L.

In his new position, Mr. Roach will retain the position of general manager, according to announcement by the board of directors.

The board of directors of The Connecticut Light and Power Company has announced the election of C. L. CAMPBELL as chairman of the board and ROBERT H. KNOWLTON as president of the company.

Mr. Campbell has served as president of the company since 1937 and Mr. Knowlton as executive vice president since 1939.

Mr. Campbell's elevation to the chairmanship of the board comes to him after more than 36 years of service with the company. In that time he has not only become well known throughout Connecticut, but has acquired a national reputation for accomplishment in the entire utility industry.

Robert H. Knowlton, who succeeds Mr. Campbell as president, has served the company since 1917. Mr. Knowlton is an engineering graduate of Cornell University and first became associated with The Connecticut Light and Power Company in a consulting capacity in 1917. In 1926 he became assistant to the president and was elected vice president in charge of sales and public relations in 1927. He was elected executive vice president in 1939 and has been a member of the board of directors since 1935.

He is a past president of the New England Gas Association and a past president of the board of trustees of the Kingswood Academy (West Hartford). At present he serves as a member of the school's board. He was formerly a member of the State Board of Mediation and Arbitration and is a member of the boards of the Edison Electric Institute and the New England Council. Mr. Knowlton is also president of the Hartford Golf Club.

ERNEST S. FIELDS, vice president in charge of the electric department, Cincinnati Gas and Electric Company, has been named general manager of that utility. He will continue to serve as a vice president and also as a member of the board of directors.

Mr. Fields joined the Cincinnati utility in 1914 when he was a co-op student at the University of Cincinnati in the department of electrical engineering. His entire business career has been with the local utility and its subsidiaries. In 1929 he was named manager of the electric department; in 1943 a vice president and two years later a director.

Active in the affairs of the American Institute of Electrical Engineers, Mr. Fields has served as a vice president and a member of the board of directors. From 1945-46 he was chairman of the engineering division of the Edison Electric Institute. At the present time he is chairman of the Committee for Coördination of Power Supply for the area embracing southwestern Ohio, all of Indiana, and parts of Michigan and Kentucky. This committee consists of operating executives of major utility companies serving that area.

WILLARD R. WEISE has been appointed assistant superintendent of electric distribution of the Cincinnati Gas and Electric Company. F. E. PINCKARD has held the position of assistant superintendent since 1936, and will continue in the dual capacity with Mr. Weise. Mr. Weise started with the company in the underground department and has been superintendent of distribution engineering since 1946.

FRANK E. WIATT, for many years associated with the Cincinnati Gas and Electric Company, has been appointed an assistant manager of that utility's electric sales department. E. B. Bentley is the other assistant manager. Mr. Wiatt, who joined CG&E in 1920, was formerly assistant supervisor of the power division of the electric sales department.

D. A. CAMPBELL, JR., of Allentown, division superintendent of Pennsylvania Power and Light Company's Lehigh Division operating department, has been transferred to operating headquarters, Hazleton, as assistant to the superintendent of lines and substations. He will be succeeded in Allentown by F. J. SHOVLIN, formerly division superintendent of the company's Schuylkill division. Both Mr. Campbell and Mr. Shovlin have had many years of varied experience in the company's operating departments. E. A. HAGENBUCH, JR., succeeds Mr. Shovlin in the Schuylkill division. He had been assistant division superintendent at Harrisburg since 1943.

Appointment of DAVID A. AITKEN as director of development activities of The Cleveland Electric Illuminating Company has been announced by J. E. North, general sales manager.

Mr. Aitken, who has been with the company's sales department since 1929, succeeds ROBERT C. HIENTON, long time director of development activities. Mr. Hienton's promotion to the position of industrial sales manager was recently announced.

During the war, Mr. Aitken served for three years as a naval lieutenant commander with various combat commands in the Pacific theater.

He was born in Cleveland, attended Glenville High School, and studied mechanical engineering at Case Institute of Technology. He is a member of the Cleveland Chamber of Commerce and the Exchange Club of Euclid.

Announcement has been made of the promotion of several West Penn Power Company employees to new positions.

J. K. WALTER, who has been Supervisor of Training for the Operating Department, was promoted to Training Supervisor, with the responsibility of coordinating the training activities in all departments of the company. Mr. Walter joined West Penn in 1934 as a Meter Reader; served as Clerk at Greensburg, and in the office of the Commercial Manager, Pittsburgh. He was Assistant to Vice President P. H. Powers for four years until he entered military service in 1942. Returning from the U. S. Army

in April 1946 with the rank of captain, Mr. Walter was appointed Supervisor of Training for the Operating Department.

CHARLES F. ANDERSON, Assistant to the Superintendent at Connellsville Power Station, has been named Staff Assistant in the Power Generating Department at Pittsburgh. Mr. Anderson will supervise training activities in that department, and will also have other specially assigned duties relating to personnel and organization matters affecting all generating stations. Mr. Anderson started with West Penn in 1934 as a Warehouseman at the Connellsville Station. He has worked as Timekeeper for the Substation Department, and at the Power Station, and has been Assistant to the Station Superintendent for the past five years.

EARL J. DECHAMBEAU, now engaged in a special Apprentice Training Course, has been promoted to Supervisor of Training for the Operating Department at Pittsburgh. He will coördinate training activities within the Operating Department. Mr. DeChambeau started with the company in 1934 as an Apprentice Meter Inspector; and has been Meter Inspector and Meter Tester on both singlephase and polyphase meters. He entered the Navy in 1942, and was a chief radio technician when discharged in 1945. Returning to West Penn as an Instrument Repairman, Mr. DeChambeau was selected last year for special Apprentice Training.

WILLIAM J. ALEXANDER has been appointed director of safety education for the Public Service Corp. of New Jersey and affiliated companies, succeeding the late John M. Orts. Mr. Alexander has been in safety work with Public Service since 1925.

BERT E. MILLER, secretary of the Wisconsin Power and Light Company, Madison, and manager of the rate and valuation department, has retired. GLYDEWELL BURDICK has been named successor to Mr. Miller.

JAMES C. LITTLEFIELD, commercial and industrial sales supervisor, has been appointed manager of the Salt Lake division, Utah Power and Light Company. He succeeds C. W. Wolfrom, who retired after 44 years with the company. Mr. Littlefield was employed by a California utility before joining UP&L in 1927.

ROY C. FOSBERG and JUSTIN H. AHRENS have been appointed industrial power consultants in the sales department of the Hartford (Conn.) Electric Light Company. Mr. Fosberg joined the company in 1929 and has been engineering assistant to the superintendent of distribution. Mr. Ahrens, with the utility since 1937, has been safety engineer.

HERBERT WOTTRICH, who has been managerial assistant, electric department, since 1937, has been appointed assistant to general manager, electric department, Public Service Electric & Gas Company. Mr. Wottrich started with Public Service in 1923 as a cadet engineer in the electric operating department.

JAMES DI ZEREGA has retired as manager of the Loudoun properties of the Virginia Electric and Power Company after 24 years of service.

CONVENTIONS AND MEETINGS

1948

MAY

3-4	Electrical Equipment Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
3-4	Transmission and Distribution Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
3-7	National Electrical Wholesalers Association, Statler Hotel, Buffalo, N. Y.
4-5	Accident Prevention Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
4-5	Hydraulic Power Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
5-7	Missouri Valley Electric Association, Rural Round Table Discussion and Sales and Rural Conference, President Hotel, Kansas City, Mo.
7-9	Westinghouse Agent-Distributors Association, Hotel Statler, Buffalo, N. Y.
10-11	Prime Movers Committee, EEI, Muehlbach Hotel, Kansas City, Mo.
10-12	Northwest Electric Light & Power Association, Business Development Section, Empress Hotel, Victoria, B. C.
10-13	National Fire Protection Association, Statler Hotel, Washington, D. C.
13-14	Pennsylvania Electric Association, Systems Operation Committee, Castleton Hotel, New Castle, Pa.
17-18	Northwest Electric Light and Power Association, Accounting and Business Practice Section, Devenport Hotel, Spokane, Wash.
18-21	National District Heating Association, Hotel Statler, St. Louis, Mo.
20-21	Pennsylvania Electric Association, Transmission and Distribution Committee, Irem Temple Country Club, Dallas, Pa.
24-25	Meter and Service Committee, EEI, Lafayette, Indiana.
27-28	Missouri Valley Electric Association, Accounting Conference, (Place to be determined).
27-28	Public Utilities Advertising Association, Hotel Cleveland, Cleveland, Ohio.

JUNE

1-3	EDISON ELECTRIC INSTITUTE, Annual Convention, Atlantic City, N. J.
9-11	Northwest Electric Light and Power Association, Personnel Section and Accident Prevention Conference, Medford, Ore.
10-11	Pennsylvania Electric Association, Prime Movers Committee, Hotel Casey, Scranton, Pa.
14-15	Arkansas Utilities Association, Arlington Hotel, Hot Springs, Ark.
16-18	Pacific Coast Electrical Association, Inc., Hotel Fairmont, San Francisco, Cal.
16-19	Canadian Electrical Association, Annual Convention, Manoir Richelieu, Murray Bay, Quebec, Can.
21-25	American Institute of Electrical Engineers, Summer General Meeting, Mexico City, Mexico

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(Terms Expiring 1950)

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(Continued)

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